# Grinding and Finishing

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★ FEATURES

Efficient Roll Grinding Practice

Where and How You Can Use Abrasive Rolls

Disc Grinding

Selecting the Right Abrasive Grain

ALSO IN THIS ISSUE

Tool and Cutter Grinding Department

Safety

Pages From the Notebook

Shop Hints and Kinks

July 1955

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JULY, 1955 — VOL. 1, NO. 3

# Grinding and Finishing

## Contents


Editor's Page ..... 9
Tool and Cutter Department ..... 42
Pages from Ronnie Burritt's Notebook ..... 53
Safety Departments ..... 54

### FEATURED ARTICLES

Efficient Roll Grinding Requires: Right Wheel, Proper Machine, a Skillful Operator, part 1 ..... 10
*by William Pope*
Where and How You Can Use Abrasive Rolls ..... 14
*by Robert McAdams and James L. Erickson*
Abrasive Grains ..... 21
*by Joseph J. Forrester*
Disc Grinding For High Production Work ..... 28
*by Roger N. Perry, Jr.*
Centerless Grinding Values Established With Standard Data, part 3 . 34
*by E. A. Cyrol*
How to Avoid Trouble When Dressing and Truing with Diamonds.. 39
*by F. M. Bley*
Polishing Metal With Rubber Bonded Wheels Can Cut Polishing Costs ..... 40
Tool & Cutter Grinding: Carrier Corporation Saves $48,000 in Reclamation or Salvaging of Cutting Tools ..... 42
*by Terrence F. Dundon*
Producing a Flat Surface by Centerless Grinding ..... 53
*by Ronnie Burritt*
Safety: Men Who Make Accidents Happen . . . and How To Handle Them ..... 54
*by Edmund Mottershead*

### SHOP HINTS AND SHORT CUTS

Surface Grinding Fixture ..... 56
Mist Cooling System ..... 57
Special Grind Improves Quality of Reamed Holes ..... 57
Use a Bit of Wheel to Dress Grinding Wheels ..... 58
Pin Arbor ..... 58

### DEPARTMENTS

Available Literature ..... 59
News of the Industry ..... 65
What's New in Equipment and Materials ..... 68
Index to Advertisers ..... 84



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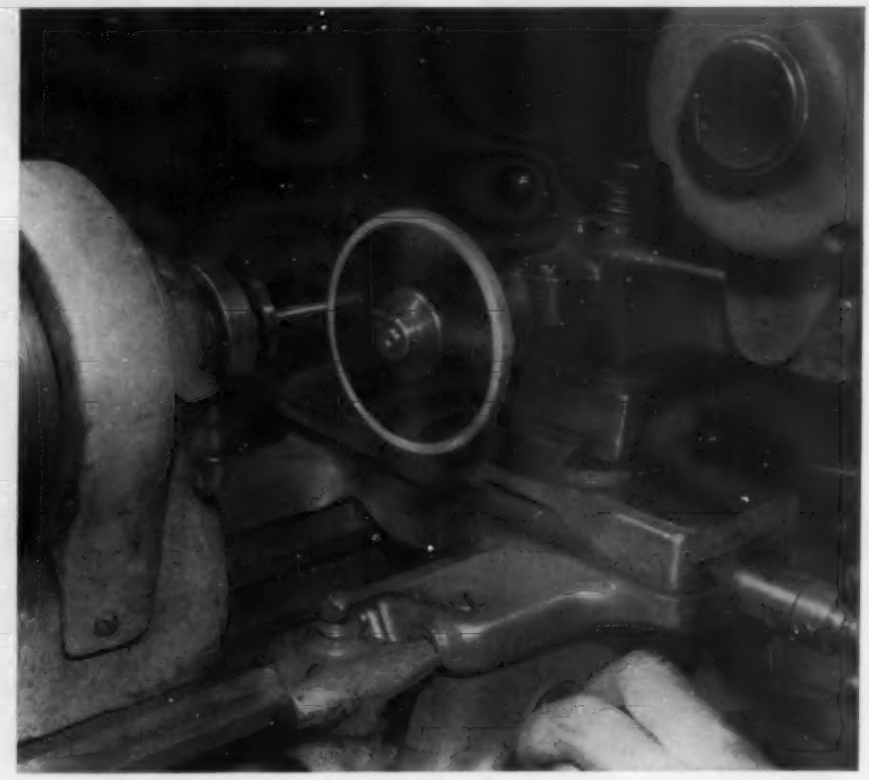

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The Editor's Page

# Calling the Experts

The other day I bumped into a chappie with troubles, though they were not connected with grinding. While a man without grinding problems is unique in itself, I was more interested in his method of solving his problem than in the problem per se.

Our friend was drilling small, blind holes in stainless and regardless of method, drills dulled and didn't last. He tried all types and kinds of drills, nothing worked. The more he stewed the less production he obtained.

Now, you and I of course, know what the trouble was: at the end of drilling cycle there was a slight dwell in the drill before it retracted, just enough to cause work hardening of the metal and consequent dulling of the tool. Our friend solved the problem by calling in a dozen drill manufacturers and the steel producer. They knew the answer. Told him. Solved the problem.

When was the last time you called in an abrasive expert, or a machine tool engineer to help you over the rough spots? Many of us have the idea that the boys who sell machines and wheels and accessories are merely pleasant guys with breezy smiles and confident attitudes; we think of them less as engineers than as salesmen. While this is often true, there are many among them who can solve problems, no matter how knotty.

Think of the problems of the automotive, aircraft and other industries during their formative years. The story of grinding in the automotive industry is a story of blood-curdling sleuthing by machine and wheel manufacturers. Automotive alone had thousands of tough problems which were solved by the wheel and machine boys. In fact, without the help of the wheel manufacturers and the machine tool builders, to say nothing of the hundreds of experts in diamonds, coolants, filters, etc., American industry would not have advanced as it has.

In this issue is an article by Terence Dundon of the Carrier Corporation who has done some fine work with salvaging and reconditioning cutting tools. One of his big thoughts is: call in the experts to help solve your problems. Too many people are not availing themselves of the knowledge and experience of the wheel and machine builders' represesentatives. If those fellows don't have the answer, they can find it for you. And if no one can solve your problem, you always can count on the representatives to commiserate with you and help drown your sorrows.

William F. Schleicher

# Efficient Roll Grinding Requires: Right Wheel, Proper Machine, A Skillful Operator . . . Part 1

By **William Pope**
National Grinding Wheel Co.
North Tonawanda, N. Y.

### Machine Must Be Powerful Enough For the Job

● ROLL-GRINDING machines are basically large, powerful, cylindrical grinding machines of very sturdy construction to assure minimum vibration when grinding. They range in size from 10-in. to 60-in. this dimension designating the maximum O.D. of the work they will accommodate. The medium and large size machines 28-in., 36-in., 48-in., and 60-in., are commonly used in steel and aluminum plants. These machines generally use a 30-in. x 3-in. or a 36-in. x 4-in. grinding wheel and are equipped

### The Machine

- √ majority of machines are supplied with ammeter to determine point of highest production rate
- √ crowning mechanism is important, permits grinding a roll with concave or convex crown
- √ many roll grinding problems caused by using too-light machines
- √ use a 36-in. grinder for 25-in. work rather than a 28-in. grinder
- √ a large machine can do 25% more work with less effort

### The Wheel

- √ abrasive grains in wheels must be controlled in size and uniformly distributed in the wheel
- √ three bonds are generally used: resinoid, vitrified, shellac
- √ the grinding wheel is, in theory, self sharpening
- √ in hard materials too large a grain causes burning and glazing
- √ once proper wheel has been found it is best to stick with it

### Surface and Finish of Rolls

- √ hot strip mill rolls require a good commercial finish; for this use a 36 to 46 grain, silicon carbide, resinoid bond wheel
- √ for reconditioning these rolls average stock removal is from .015-in. in finishing stands to .040-in. in early stands
- √ hot strip back-up rolls use a 24 to 40 grain, aluminum oxide, resinoid bond wheel
- √ cold mill work rolls use an 80 - 150 grain, shellac or resinoid wheel
- √ temper mill and skin mill working rolls use an 80, 120, 150 grain, shellac bond wheel

### Fluids and Compounds

- √ plain water is best, but it rusts the work and machine
- √ we use crystal-sal-soda and have found it best
- √ do not use strong alkali solutions, they affect shellac and resinoid wheels

. . . roll grinding requires extreme skill because it is precision grinding of a high caliber. You cannot produce rolled steel strip or aluminum sheet of required quality unless rolls are accurately ground.

with an effective filtering device in the coolant system. Rolls are generally ground by supporting them on their necks and journal rests may be either brass, cast-iron, or babbit; the latter provides a cooler bearing with less tendency to score the necks than brass or iron. The roll drive is generally of the universal type to insure uninterrupted and smooth rotation. Most roll-grinding machines are designed so that the wheel traverses, wheel speed and roll speed can be varied and the skilled operator regulates each to obtain the best grinding results. The majority present-day machines are supplied with ammeters to which the operator can refer to obtain the highest rate of production possible, and learn at what point the wheel is working at its maximum efficiency. A crowning mechanism is an important feature of the conventional roll-grinder, because it is necessary to crown many of the rolls used in steel, aluminum and paper mills. This attachment makes it possible to grind rolls either with a crown or a concave.

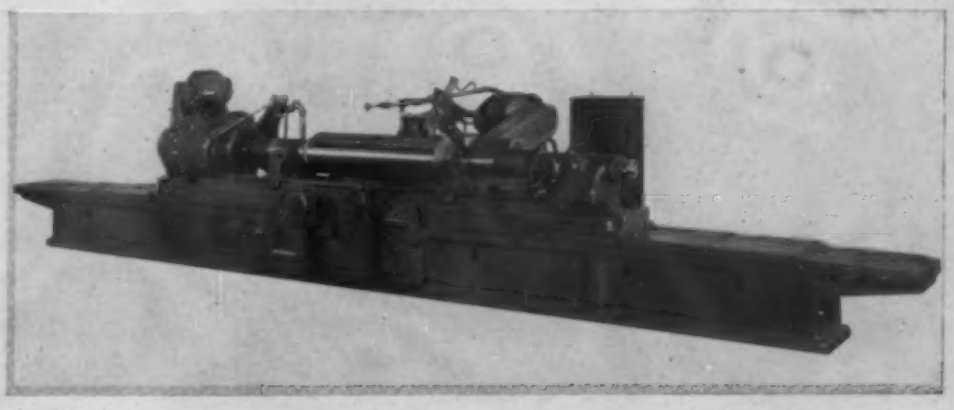
To withstand the high stresses set up when grinding, it is essential that the machines are of heavy construction and are equipped with a generous size wheel spindle bearing and motors. Many of our roll-grinding problems today are due to the fact that the equipment being used is too light for the work. For example, a 36-in. grinder is far superior to a 28-in. grinder when grinding 25-in. diameter hot mill work rolls, where an average of .030-in. stock removal is required. In this instance, the larger machine will do at least 25% more work with less effort, for the simple reason that the larger machine is more rigid and has the size wheel spindle and power to breakdown the wheel when applying heavy feeds.

Six different manufacturers in this country make roll grinding machines: Mesta Machine Co., West Homestead, Pa.; Landis Tool Co., Waynesboro, Pa.; Norton Co., Worcester, Mass.; Cincinnati Grinders, Inc., Cincinnati, O.; Farrel-Birmingham Co., Ansonia, Conn.; Lobdell United Div. United Engineering and Foundry Co., Wilmington, Del.

### Right Wheel is Essential For Best Results

The cutting action of a wheel depends upon: (1) the kind of abrasive, (2) the size of the abrasive grains, (3) the bond which holds the abrasive grains together, (4) the spacing of the grains in the bond, or the structure. For uniform and dependable cutting action, the abrasive grains must be of controlled size and uniformly distributed throughout the wheel. These grains are held together by one of three bonds: Resinoid (Synthetic resin), Vitrified or Ceramic, and Shellac. The strength with which the bond holds the grain is known as the grade or the hardness of the wheel and can be varied through wide limits. Note that the hardness of the wheel does not relate to the hardness of either the abrasive or the bond, but only to the resistance the bond offers against letting the abrasive be torn out of the wheel. Structure is the relationship of abrasive grains to bonding material and grinding wheels can be made dense or open to suit grinding conditions. Grain sizes run from 10 to 600 and wheel diameters from 14-in. to 36-in. and 2-in. to 6-in. in width.

The grinding wheel is in theory, and to some degree in practice, self-sharpening. Grains fracture and present new cutting edges, or when dulled and badly worn down they are torn out of their setting and so allow other grains to come into play. When



These grinders, made by Cincinnati Grinders, Inc., are available in two styles: (1) with conventional center type grinder equipment for straight cylindrical and taper work; (2) with cambering equipment for roll grinding operations. Roll grinding machines are equipped with single tables and set-over footstocks. Automatic balancing of the grinding wheel is a feature.

an abrasive grain starts to enter and penetrate the work as the wheel and work revolve, the depth of the cut gradually increases to a maximum somewhere along the arc of contact, and since the wheel usually rotates much faster than the roll, the greatest depth of cut is very near the spot where the wheel leaves the work. In hard materials, too large a grain size causes burning or glazing.

**Roll Material and Quality of Surface and Finish Required on Hot Strip and Cold Strip Mill Rolls**

Hot strip mill working rolls, so called because they are used for rolling hot steel in strip mills, are invariably made of nickel grain or a nickel chill casting. The size of the work rolls vary from 12-in. to 30-in. in diameter and from 24-in. to 132-in. in length. Alloy content is generally chrome, nickel, and molybdenum, and Shore hardness of bodies run from 70 to 84 sclerescope. These rolls require a good commercial finish which can generally be accomplished with a 36 to 46 grain silicon carbide, resinoid wheel. In reconditioning these rolls for the mill, average stock removal runs from .015-in. in the finishing stand to .040-in. in the early stands. To obtain a sheet of equal gauge and thickness throughout its width, the top roll is crowned by a crowning device in the roll-grinding machine, to compensate for the deflection of the roll caused by the tremendous rolling pressures. These crowns vary, depending upon the gauge and width of strip rolled and range from .005-in. to .025-in. in diameter. Surface and finish requirements vary somewhat in different mills, depending upon the material to be rolled and standards set up in individual plants.

Hot strip mill back-up rolls are either cast alloy steel or forged steel, with Shore hardness from 48 to 58 sclerescope on the cast roll and from 60 to 80 sclerescope on the forged sleeve rolls. Back-up rolls are up to 60-in. in diameter and up to 130-in. in length. These rolls are usually ground with a 24 to

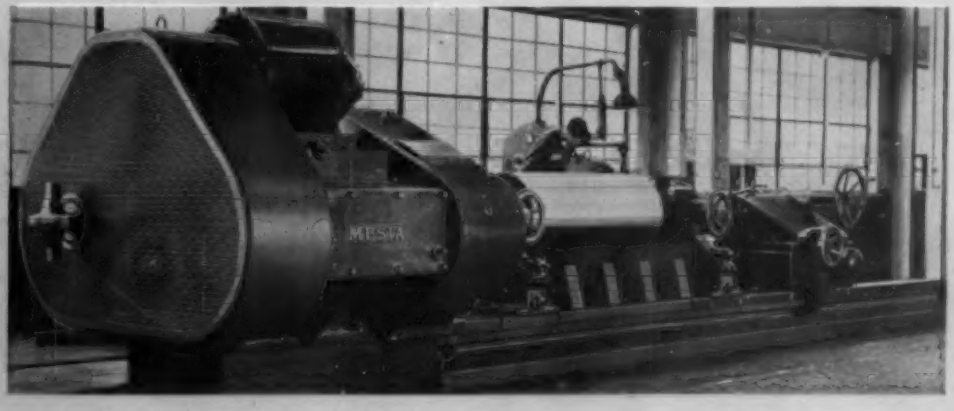
**. . . finish on the rolled material can be no better than the surface of the roll itself.**

**. . . the best wheel is useless unless used on the right job.**

40 grain aluminum oxide, resinoid wheel. It is essential that the back-up rolls are accurately ground and checked for straightness and out of round to avoid rolling troubles in the mill.

The majority of cold strip mill working rolls are made of forged steel; however, some cast nickel grain and nickel chill work rolls are used on the tandem and skin mills. The forged hardened steel work rolls are 97 to 102 sclerescope, while the Shore hardness of the cast rolls runs from 86 to 90 sclerescope. Cold mill, cluster-mill, and skin mill working rolls vary in size from 2-in. to 30-in. in diameter and from 16-in. to 96-in. in length. Cold reduction is performed to reduce the strip thickness, to improve the surface and to alter the characteristics of the steel. Inasmuch as the material is reduced to its finished gauge during the cold rolling operation and takes its final finish from the rolls, it is obvious that these rolls must be ground with dimensional and surface accuracy. For the average run of cold mill work rolls, the finish produced with 80 to 150 grain wheels is considered satisfactory. Generally speaking, resinoid and shellac bond wheels are preferred in grinding cold mill rolls. Vitrified wheels are a minor factor, and when found are in 80 to 100 grit. Cold mill roll surfaces must be free from chatter and scratches, feed lines, diamond dressing tool marks, etc.

Forged steel tandem mill work rolls are usually ground with 80 grain aluminum-oxide resinoid bond wheels. However, 80, 120 and 150 grain shellac bond wheels are being used to good advantage on temper mill and skin mill working rolls, as well as on the tandem mill finishing stand. On these applications,



**A traveling table type roll grinder made by Mesta Machine Co. This grinds diameters up to 28-in. A traveling wheel head type grinder has been designed for larger diameters. A crowning and concaving mechanism is an integral part of all Mesta machines.**

A 50 x 216-in. roll grinder shown grinding a test roll at Landis Tool Co. This machine grinds such large rolls that it is more feasible to traverse the wheel head than the work. The operator travels back and forth with the wheel head.

the average grinder operator prefers a good shellac bond wheel; it stays sharp and free-cutting and produces the desired finish in less time and effort because it is easier to work and does not produce chatter as readily as a resin bond wheel, under the same conditions.

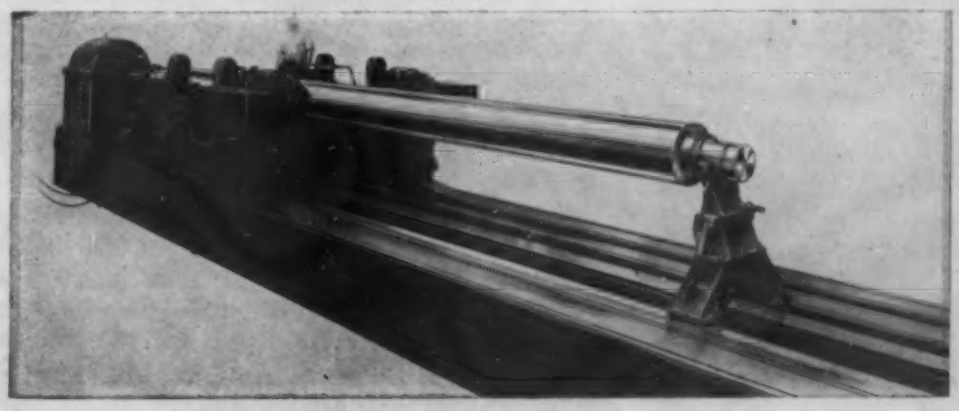
### The Purpose of Grinding Fluids Are:

1. To keep the temperature of the work as uniform as possible and prevent extreme localized heating.
2. To reduce friction between the wheel and the work and to lower the resistance of the metal to the action of the abrasive.
3. To retard loading of the wheel face.
4. To assist the wheel in producing the desired finish.

After trying many different kinds of grinding fluids over a period of years, we found that they are all a necessary evil as far as roll-grinding is concerned. Plain water is the best possible coolant, but it rusts the work and the machine parts. To prevent this, we used a crystal-sal-soda and found this to be superior to all other types of grinding compounds used for roll-grinding. Soluble oil type grinding fluids should not be used with hard water since they adversely affect the cutting action of the wheel and cause the face of the wheel to glaze. Strong alkali solutions should not be used with shellac of resin bonded wheels as they will attack the bond. Soap solutions are good coolants, technically, but they tend to foam and cover the work to the point where the operator is handicapped. The many grinding fluids on the market have merit and are almost indispensable for centerless, surface and internal grinding. However, on roll-grinding (except as an aid to produce certain finishes) we preferred crystal sal-soda to all other grinding compounds.

This material was originally presented before the spring conference of the A.I.S.E., Detroit, April 26, 1955.

End of Part 1. ● ●



These grinders, made by Farrel-Birmingham, are built in six standard sizes to take diameters from 24 to 60-in. in any length required. The wheel head rests on a subbase which is hinged in front on two tapered trunnions. A patented crowning and concaving device is of the adjustable eccentric type.

by **Robert McAdams** and
**James L. Erickson**
American Abrasive Products, Inc.
Dayton, Ohio

# Where and How You Can Use Abrasive Rolls

### *What are Abrasive Rolls?*

a continuous coil of coated abrasive strip wound and glued tightly together in the form of a roll
it is mounted on a mandrel
when pressed against work surface abrasive action takes place
an abrasive roll is similar to a jelly roll in design

### *Where are Abrasive Rolls Used?*

aircraft plants
automotive plants
glass manufacturing
home appliance plants
machine shops
welding and joining shops

### *How are Abrasive Rolls Used?*

deburr holes or pierced sheets
polish glass molds
polish and clean dies
paint and body shops
smooth out welds
remove sharp edges

### *What are some Advantages of Abrasive Rolls?*

they are cheap to use
low initial cost
low final cost
safe to use

● AN ABRASIVE roll is nothing more than a tool of an expendable nature used to abrade a softer material than itself for the purpose of cleaning, grinding, and/or polishing a surface.

The abrasive roll, figure 1, consists of a continuous coil of coated abrasive strip wound and glued tightly together in the form of a roll, much like a rug that has been rolled up for transit.

In use, the abrasive roll is mounted on a mandrel, figure 2, that slips up into its center hole, which has been left for this purpose in the preparation of the roll, and the mandrel is then revolved at a speed ranging from 1,000 r.p.m. to 35,000 r.p.m. Next the revolving roll is pressed up against the surface which is to be cut, or literally worn away, by the tiny particles of aluminum oxide (or in the case of some rolls: silicon carbide) which are embedded in the surface of the coated abrasive cloth, or strip which has been used to make the roll. As the cutting action procedes, the roll itself actually wears away, not however, when properly used, without a substantial cutting effect on the surface being worked. This wearing away of the roll proceeds by the successive disintegration of the closely coiled layers of coated abrasive cloth: first the particles, then the cloth itself, then the next layer of particles, then the cloth holding these, and so on. An abrasive roll is similar to a jelly roll in design: Frosting, then cake, frosting, then cake, in spiral form.

The abrasive roll is mounted for use on a mandrel, figure 3, which is itself revolved by a power unit such as a rotary air grinder, an electric grinder, etc. While revolving, the abrasive roll is pressed against the surface to be worn away. The abrasive particles embedded on the surface of the roll cut the surface contacted and effect the desired eroding action. Incidentally, such a surface, as we shall discuss later,

might be a paint, oxide, metal, glass, ceramic, cement, leather, wood, cloth or plastic material.

### How Abrasive Rolls are Made

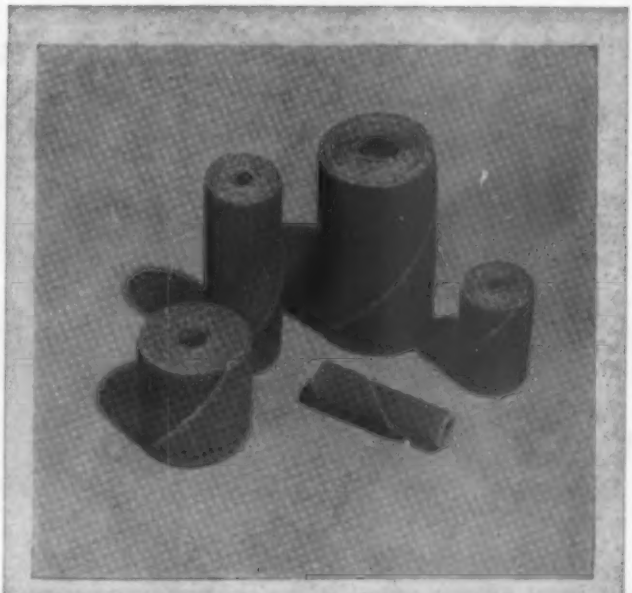
Abrasive rolls are made by coiling strips of abrasive cloth of the proper length, width, and grit. The proper length and width is achieved by cutting abrasive cloth to the proper size or pattern by means of cutting shears similar to those used by a printer to cut his paper to size. The cut strips, all of uniform size, are then inserted into a coiling machine that automatically places a film of special bonding glue on the reverse side of the coated abrasive strip from that on which the abrasive particles are held, and coils the strip into the familiar abrasive roll shape, ejects the roll after it has been produced, and continues to make another roll.

The specially designed machine for the coiling operation is very precise in its work and produces rolls of uniform structure consistently and without deviation.

Incidentally, the bonding agent, or adhesive, employed to hold the coil of abrasive strip together and keep it from unrolling like so much clock spring when in use, is applied only to one edge of the back side of the abrasive strip, figure 4. It is as if one had a jelly roll with jelly only in one end of the roll. The application of bonding agent to only one edge of the strip as it is coiled is intentional, for the bonding agent is a stiffener, and since one of the very important properties of an abrasive roll is its flexibility, the bonding agent is only employed at one end of the roll in order to keep it together. The other end of the roll is left, in a sense, free and host to the desired flexibility.

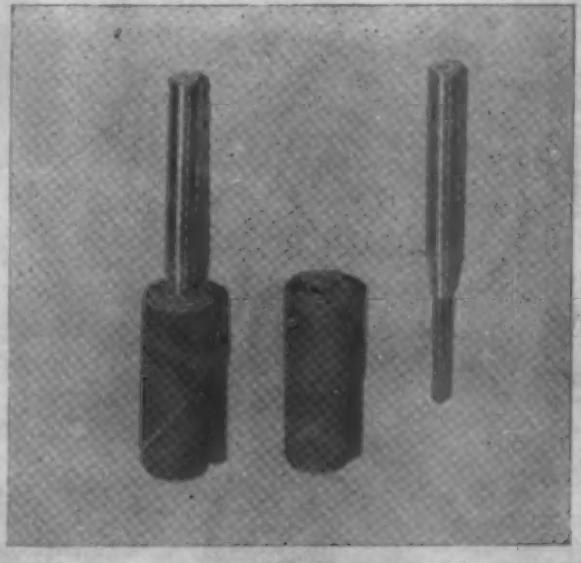
The width of the strip of bonding agent applied can be varied from a full glued area equal to the length of the roll down to say ¼ of an inch—the usual width being equal to ¼ of the length of the roll (the length of the finished roll of course being equal to the width of the strip of coated abrasive cloth used to make the roll), see figure 4. It is the case that if the glue is applied in too narrow a strip, the roll will not be held together properly: if the glue is applied in too wide a strip, the roll does not possess proper flexibility.

Since abrasive rolls are formed of a single coiled strip of abrasive cloth, the inner end of which is held by friction to the mandrel while it is revolving, and since the coil is so wound that it tends to become more tightly wound as it is revolved at high speed, the roll when in use does not fly apart as it is revolving. Even so, some users of abrasive rolls request that the abrasive roll manufacturer wrap around the base, or glued end, of the abrasive roll (that is, the end which slips onto the mandrel first) a strip of strong adhesive cloth or masking tape approximately ⅛ to ¼ of an inch in width as additional assistance, as it were, to the bonding agent to keep the roll from



1a. Various sizes of abrasive cartridge type rolls.

1b. Various sizes of abrasive full taper spiral type rolls.



2. Mandrel and abrasive cartridge type roll shown separately.

# FROM COAST TO COAST REPORTS

**ON HIGH SPEED STEEL:**
"Holds form twice as good. Does not burn or load."

**STEEL SAW RESHARPENING:**
"Held size...smooth and cool cut... no burn."

**ON HIGH SPEED STEEL DIE BUTTON:**
"Less heat, no burn and allows heavier stock removal per pass."

**BROACH GRINDING:**
"Three times the production... much cooler cutting."

**DRILL GRINDING:**
"Three times the production...no chatter on small drills...no burn...better finish."

**ON HIGH SPEED STEEL FLAT FORMS:**
"Gave cuts up to .040" with very little breakdown."

# "V-40 IS

**TRY ONE NOW** in your own shop, on your own equipment. See how "V40" outperforms any other tool room wheel you can use. Call your CARBORUNDUM Distributor or salesman for a demonstration today. He's listed in the yellow pages of your phone book under "Abrasives" or "Grinding Wheels." Or write The Carborundum Company, Dept. GF 81-513, Niagara Falls, New York. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ontario.

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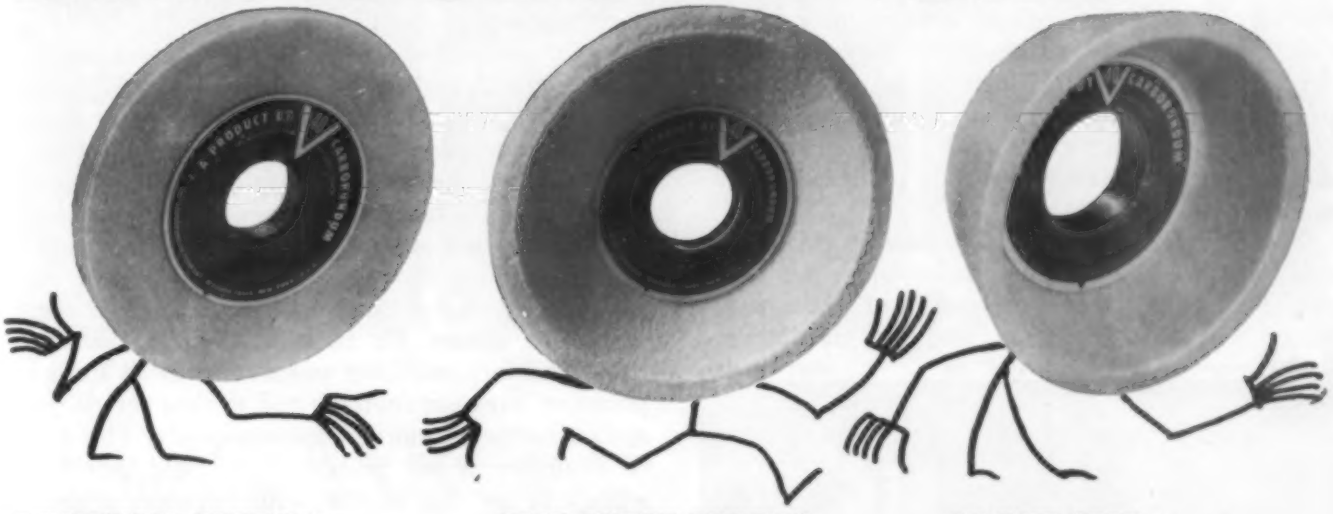
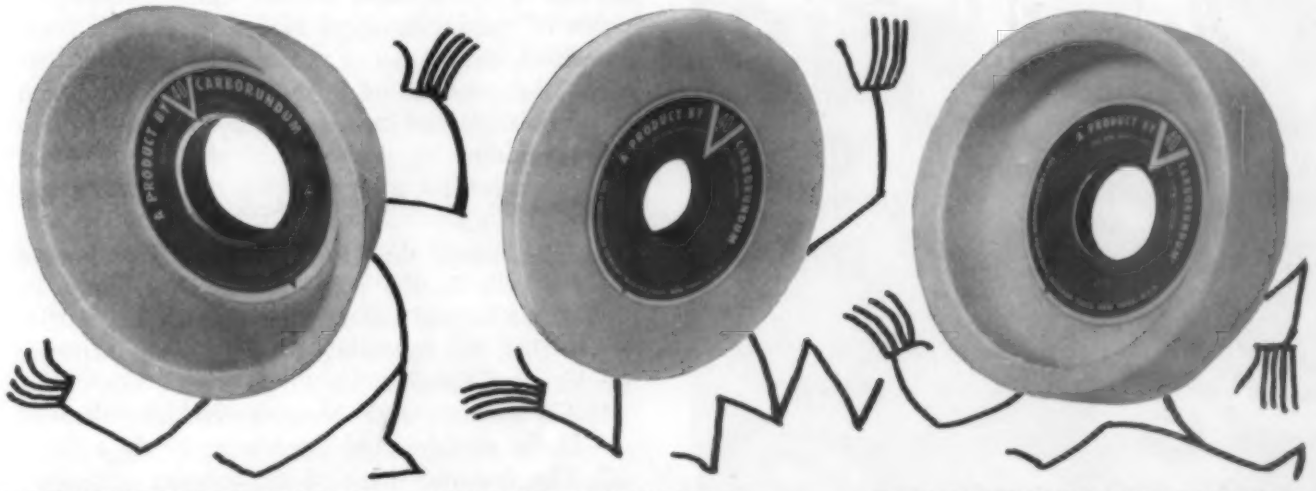


**CYLINDRICAL GRINDING:**
"Dresses with ease...better finish and cuts more freely."

**GEAR CUTTER GRINDING:**
"Much less wheel breakdown. No burn."

**ON SOFT STEEL:**
"Superior in all respects."



**CIRCULAR BROACH GRINDING:**
"8 broaches per dressing against normal 3."

**ON CHROMOVAN DIES:**
"Excellent size control. Gave cuts of .010" with very cool work."

**SIDE MILLING CUTTER GRINDING:**
"Held size around the cutter. No burn on cutter."

# TERRIFIC"

**WHAT USERS SAY** about "V40" Wheels is important to us...and to you! It provides the most critical measure of performance where it counts most—*on the job!* The comments above are but a few received from hundreds of "V40" Wheel users all over the country...in every type of grinding operation...on many different materials.

**YOU CAN BENEFIT** from the outstanding features of "V40" Wheels. For example, the superior form-holding ability of "V40" eliminates costly stops for wheel dressing and re-set-up midway through a job. Yet the special vitrified bond permits far faster, easier dressing between jobs—with substantial savings in diamonds, time and abrasive.

## CARBORUNDUM

REGISTERED TRADE MARK

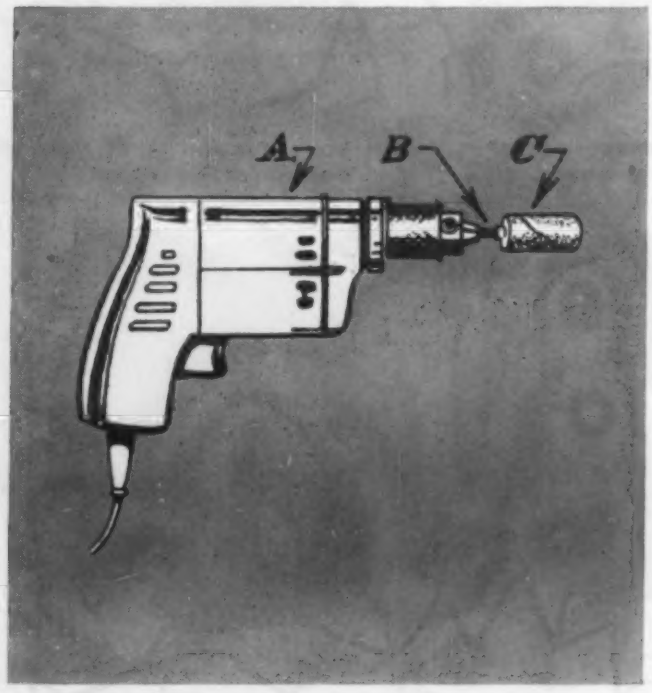
*...continually putting more* **SENSE** *in your abrasive* **DOLLAR**

01-010

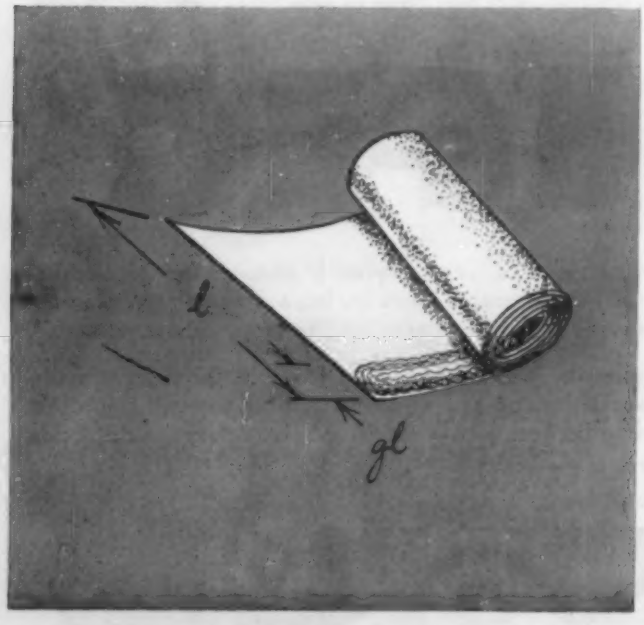
Encircle No. 207 on card opposite Page 68

unwrapping during its use. For speeds of revolution less than 10,000 r.p.m. this extra tape is not necessary. Not all who use abrasive rolls even at high speeds (10,000 r.p.m. and up) have found the added tape necessary. The writer feels that the use of such tape probably owes its existence to the failure of the bonding agent to properly hold a roll together on one or more runs of faulty rolls produced many years ago.

The principal advantages of abrasive rolls as a tool for cleaning, polishing, deburring, etc. are two: (1) Their low initial and final cost and (2) their flexibility. The first advantage needs no elaboration.




**3. Portable electric drill (A) with mandrel (B) and abrasive roll (C).**




**4. Partially unrolled cartridge roll of over-all length, l, and with a glued length, gl.**

The second characteristic imparts to the roll its usefulness for such applications as polishing the die cavity surfaces of molds used to make (1) die castings, (2) permanent mold castings, (3) wax investment patterns for investment castings, (4) glass products, (5) plastic mouldings, etc. where it is absolutely essential that during the polishing operation on such dies and molds, no under-cuts be created in the die cavity face. In addition, flexibility makes it possible to use abrasive rolls successfully on surfaces of complicated or unusual contour and yet obtain a uniform cutting, or abrading action, over the entire surface. Or more simply, the abrasive roll's flexibility enables it to conform to all surface points on irregular contours and to thus abrade the surface contacted more or less uniformly. This sort of flexibility is not possible with rigid grinding wheels, or for that matter, with improperly glued abrasive rolls. Thus the abrasive roll is ideal for blending contours together to form uninterrupted surfaces. A typical use of abrasive rolls in this respect is that of employing them to remove parting lines, seam lines, etc. on cast or moulded products in cases where the presence of such lines of demarcation are undesirable and cannot be removed by mechanical trimming.

### The Degree of Abrading Action

A discussion of the cutting or abrading action of abrasive rolls in the more technical terms of its physics are beyond the scope of this article. Suffice to say that the following factors act to influence the degree of abrasion.

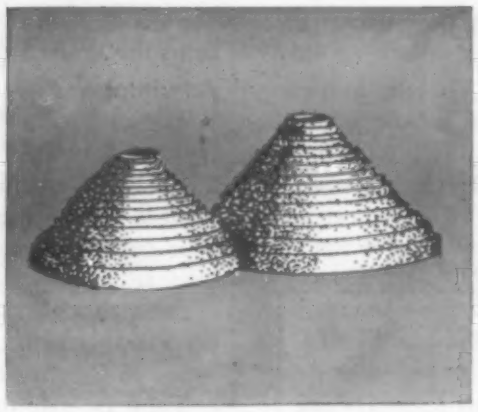
1. The hardness of the abrasive particles embedded in the abrasive cloth used to make the rolls
2. The size and shape of the abrasive particles
3. Their distribution and abundance
4. The degree to which they are bonded to the surface of the abrasive cloth
5. The force with which they are placed in contact with the surface to be abraded (a force which in turn is a function of the diameter of the roll, the roll's r.p.m., and the magnitude of the force used to press the roll against the surface to be abraded)
6. The nature of the surface to be abraded, i.e. its hardness, its degree of smoothness, melting point, etc.

Unfortunately, no one has worked out a mathematical formula suitable for ship use that enables one to calculate the optimum grit size, roll shape, roll r.p.m., applied force, etc. given the physical properties and mechanical characteristics of a surface to be abraded and the end results desired.

### Sizes and Types of Abrasive Rolls

There are two major types of abrasive rolls: (1) the cartridge (sometimes the smaller diameter rolls of this group are referred to as "pencil" type rolls,

5. Cartridge type abrasive rolls.



6a. Full taper type abrasive rolls.

6b. Partial taper type abrasive rolls.

figure 1a and 5, and (2) **the spiral,** figure 1b, 6a and 6b. The cartridge types merely have the same outside diameter over the entire length, while the spiral rolls do not, i.e. they are smaller on one end than the other. Their end of largest outside diameter is always the end which is slipped onto the mandrel first.

Spiral rolls are subdivided into two classes: (1) the **full taper** type, figure 6a, and (2) the **partial taper** type, figure 6b. The only difference between the two is that in the case of the full taper, the outside diameter begins to decrease beginning at the base end, while in the case of the partial taper, the outside diameter does not begin to decrease immediately but does begin to decrease anywhere from ¼ to ¾ of the distance between the ends of the roll—leaving the remaining length of the roll of uniform diameter equal to the major outside diameter.

One can readily see that in order to manufacture a cartridge type roll, one need only cut the abrasive cloth perpendicular to its length and then roll this strip in such a manner that the edges of the strip form a flat edge, or plane. These flat edges form the top and bottom of the roll.

To manufacture a spiral roll, a strip of abrasive cloth is cut in the form of a right triangle; this strip is then rolled beginning with the base of the triangle to form the inside diameter of the roll. Naturally, as the roll is rolled the longest side of the strip opposite the hypotenuse forms a flat base, and the hypotenuse, inasmuch as it is on an angle, spirals from the top edge of the roll on down progressing to the roll's base. In so doing, the diameter of the roll increases from the outer edge to the base.

Table No. 1 lists the most common sizes of the different classes of abrasive rolls. An examination of this table shows that the smallest cartridge type abrasive roll in common use is ¼" OD x ¾" Face x ⅛" HS, while the largest is 1½" OD x 2" Face x ¼" HS. Rolls both larger and smaller than these extreme sizes are made, but generally on special order only.

## Mechanics of Their Use

Abrasive rolls are slipped easily onto mandrels whose shaft slips into the inside of the roll, figure 2. The base end of the roll butts up against a threaded spiral tapered position on the mandrel. This portion is short in length, while the remaining end of the mandrel fits into the chuck of an air or electric motor driven tool which revolves the mandrel at high speed. As the mandrel revolves, so does the abrasive roll, and if pressure is applied to the roll, the mandrel tends to literally screw itself up into the inside diameter of the roll—which in turn tends to prevent the roll from slipping and keeps the roll revolving at the same rate as the mandrel.

While the abrasive roll is whirling around, its surface is brought into contact with the surface to

7. Die casting die maker polishing a cavity face of a die casting die.

be abraded. The grit moves across the surface of the work in a cutting action.

When abrasive rolls are used to obtain a high polish on a die casting die cavity that is host to deep tool marks, a small grit numbered roll say, 80 grit, is used first; then in a series of stages a succession of rolls of 120 grit, 180, 220 grit, and so on are used until the desired degree of polish is obtained.

**TABLE ONE: Part A**
**COMMON SIZES OF CARTRIDGE ROLLS**

| Outside Diameter | Length or Face | Outside Diameter | Length or Face |
|---|---|---|---|
| 1/4" | 3/4" | 1/4" | 1 1/2" |
| 5/16" | 3/4" | 5/16" | 1 1/2" |
| 3/8" | 3/4" | 3/8" | 1 1/2" |
| 1/2" | 3/4" | 1/2" | 1 1/2" |
| 5/8" | 3/4" | 5/8" | 1 1/2" |
| 3/4" | 3/4" | 3/4" | 1 1/2" |
| 1" | 3/4" | 1" | 1 1/2" |
| 1 1/8" | 3/4" | 1 1/8" | 1 1/2" |
| 1 1/4" | 3/4" | 1 1/4" | 1 1/2" |
| 1 3/8" | 3/4" | 1 3/8" | 1 1/2" |
| 1 1/2" | 3/4" | 1 1/2" | 1 1/2" |
| 1/4" | 1" | 1/4" | 2" |
| 5/16" | 1" | 5/16" | 2" |
| 3/8" | 1" | 3/8" | 2" |
| 1/2" | 1" | 1/2" | 2" |
| 5/8" | 1" | 5/8" | 2" |
| 3/4" | 1" | 3/4" | 2" |
| 1" | 1" | 1" | 2" |
| 1 1/8" | 1" | 1 1/8" | 2" |
| 1 1/4" | 1" | 1 1/4" | 2" |
| 1 3/8" | 1" | 1 3/8" | 2" |
| 1 1/2" | 1" | 1 1/2" | 2" |

**TABLE ONE: Part B**
**COMMON SIZES OF SPIRAL ROLLS: Full Taper**

| Base Diameter | Overall Height | Base Diameter | Overall Height |
|---|---|---|---|
| 3/8" | 1" | 1/2" | 1 1/2" |
| 1/2" | 1" | 5/8" | 1 1/2" |
| 5/8" | 1" | 3/4" | 1 1/2" |
| 3/4" | 1" | 7/8" | 1 1/2" |
| 7/8" | 1" | 1" | 1 1/2" |
| 1" | 1" | | |

**SPIRAL ROLLS: SIDEWALL TYPE: Partial Taper**

| Base Diameter | Overall Height | Sidewall Height | Base Diameter | Overall Height | Sidewall Height |
|---|---|---|---|---|---|
| 1/2" | 1" | 3/4" | 1" | 2 1/4" | 1 1/4" |
| 1/2" | 1 1/4" | 1" | 1" | 2 1/2" | 1 1/2" |
| 1/2" | 1 1/2" | 1 1/4" | 3/4" | 1" | 3/4" |
| 1/2" | 1 3/4" | 1 1/2" | 3/4" | 1 1/4" | 1" |
| 1/2" | 2" | 1 3/4" | 3/4" | 1 1/2" | 1 1/4" |
| 1/2" | 2 1/4" | 2" | 3/4" | 1 3/4" | 1 1/2" |
| 1/2" | 2 1/2" | 2 1/4" | 3/4" | 2" | 1 3/4" |
| 3/4" | 1" | 1/2" | 3/4" | 2 1/4" | 2" |
| 3/4" | 1 1/4" | 3/4" | 3/4" | 2 1/2" | 2 1/4" |
| 3/4" | 1 1/2" | 1" | 1" | 3/4" | 1/4" |
| 3/4" | 1 3/4" | 1 1/4" | 1" | 1" | 1/2" |
| 3/4" | 2" | 1 1/2" | 1" | 1 1/4" | 3/4" |
| 3/4" | 2 1/4" | 1 3/4" | 1" | 1 1/2" | 1" |
| 3/4" | 2 1/2" | 2" | 1" | 1 3/4" | 1 1/4" |
| 1" | 1 1/4" | 1/4" | 1" | 2" | 1 1/2" |
| 1" | 1 1/2" | 1/2" | 1" | 2 1/4" | 1 3/4" |
| 1" | 1 3/4" | 3/4" | 1" | 2 1/2" | 2" |
| 1" | 2" | 1" | | | |

## Advantages

Abrasive rolls are cheap to use. Their initial cost is low compared to mounted, hard stone points. Their final cost is also low because they are not subject to the same breakage characteristic of ceramic type cutting wheels and most mounted hard stone points.

Even though they are expendable, they do last a surprisingly long time in use as compared with other types of abrasive cutting tools.

They are safe to use.

They are flexible and tend to assume the shape of the surface they contact when revolving, thus uniformly cutting the surface they contact. In addition, they wear away evenly and not in one or two spots on their surface.

## Specific Applications

Certain industries have already discovered the advantages of abrasive rolls and are taking full advantage of them. Here are some of the uses:

**Aircraft:** to deburr holes drilled or pierced in aluminum sheet prior to riveting; deburr sharp corners and edges of aluminum sheet; smooth out seam lines in sections made up of aluminum sheets.

**Glass:** to polish new glass molds; clean old glass molds; polish glass itself.

**Die Casting and Permanent Mold Casting:** to polish new dies, figure 7; clean dies in use; deburr castings; remove parting lines.

**Automotive:** in their tool shops; assembly lines; paint shops; body works; etc.

**Home Appliances:** to remove burrs from formed steel sheet parts and stampings; touch-up work in the paint shop and on the assembly lines; maintain their tools; deburr the cut-ends of steel tubing, etc.

**Welding and Joining Shops:** to prepare surfaces for welding and to smooth out welds.

**Machine Shops:** to remove sharp edges, burrs, tool marks, etc. ● ●

"Just act natural—like you don't know who raised the coolant spray pipe in his direction."

# Abrasive Grains

By **Joseph J. Forrester,**
Manager of Product Engineering
Electro Minerals Division,
The Carborundum Company
Niagara Falls, New York

- V a friable fused Aluminum Oxide wheel is a cool cutting wheel: ideal for tool room applications
- V use a semi-friable wheel on non-metallic materials where speed of cut and coolness of cut is desired
- V tough fused Aluminum Oxide is used in coated abrasives, also for snagging wheels
- V extra tough fused Aluminum Oxide is ideal for tumbling operations or set up wheels
- V Silicon Carbide is used for carbide grinding and for heavy duty snagging wheels

● IT IS commonly accepted in industry that aluminum oxide, figure 1, is used in treating materials of high tensile strength, and silicon carbide, figure 2, is used in treating materials of low tensile strength such as cast iron and non-metallic materials including glass, stoneware, granites, marble, etc. These are the two types of abrasive grains most commonly used in abrasive applications.

### Fused Aluminum Oxide

There are four types of fused aluminum oxide: friable, semi-friable, tough, and extra tough, and each has its particular place in the scheme of abrasive action, and each can be produced to provide particular effects in its end-use application.

#### FRIABLE FUSED ALUMINUM OXIDE

This material is the readily recognized white fused aluminum oxide, figure 3. It is manufactured by the electric furnace fusion of relatively pure aluminum oxide, approximately 99% $Al_2O_3$. Since the raw material used in the furnace operation is quite pure, little or no reduction of oxide impurities is effected, it is simply a fusion process resulting in a relatively pure white fused aluminum oxide. Because of the lack of impurities in the raw materials fed to the furnace, very little matrix is formed to contain the crystals of fused aluminum oxide. Consequently, the alumina crystals are weakly held together and, when incorporated in an abrasive body, will break away under relatively light pressure, resulting in a cool cutting abrasive product. This type of fused alumina abrasive finds particular application in vitrified abrasive wheels used for tool room grinding.

The use of fused white aluminum oxide as a loose grain abrasive, or polishing abrasive, is somewhat limited. Its principal use outside of vitrified abrasive wheels is in the buffing and finishing field where the powder sizes are used as ingredients in buffing compounds to provide a relatively high degree of cut and stock removal without particular concern about luster.

#### SEMI-FRIABLE FUSED ALUMINUM OXIDE

The semi-friable type of fused aluminum is the result of the metallurgical reduction of bauxite in the electric furnace, figure 4. It is recognized in the abrasive industry that the titania content of fused alumina governs the toughness or lack of friability of the abrasive grain—the lower the titania content, the more friable the resultant grain. Conversely, the higher the titania content, the tougher the grain. As indicated above, white fused alumina contains little or no titania and hence is quite friable. In the manufacture of semi-friable fused alumina, bauxite which normally contains 3-5% of titania is reduced to a titania content of 1.70% to 2.40% in the electric furnace.

While we have produced in the electric furnace a type of semi-friable fused alumina we can still control the effective friability of the resultant grain. This is accomplished by controlled crushing of the crude product from the electric furnace. It is recognized that a sharp type of fracture of the crude fused alumina will further increase the friability of the resultant grain. By controlled crushing we can produce an extra friable semi-friable type of fused alumina. This sort of material is especially indicated for use in cutting-off wheels, either vitrified or organic, or in set-up wheels for the polishing of sheet metals, relatively soft metals such as brass, bronze or aluminum, or in non-metallic materials where speed of cut and coolness of cut is more to be desired than stock removal.

By additional controlled crushing methods we can produce a grain which retains the semi-friability

of the crude furnace product but at the same time imparts to the resultant product a somewhat longer life than we experience with the extra sharp semi-friable fused alumina. There are applications, both in bonded abrasives, set-up wheels and loose grain applications, where a relatively tough, semi-friable grain is indicated. Such applications include bonded products for general grinding operations, and loose grain and set-up wheel applications where stock removal and ultimate finish are of prime importance.

Again with our semi-friable crude we can further control our crushing to produce a blocky type of abrasive for use in foundry snagging wheels, polishing grains for use in set-up wheels for polishing farm implements and other types of products requiring a rugged type of grain for rough and finish polishing.

Controlled crushing can be carried still further to produce an extra blocky type of grain for use in glass bevelling, pressure blasting, lithoplate graining and tumbling operations for deburring and finishing.

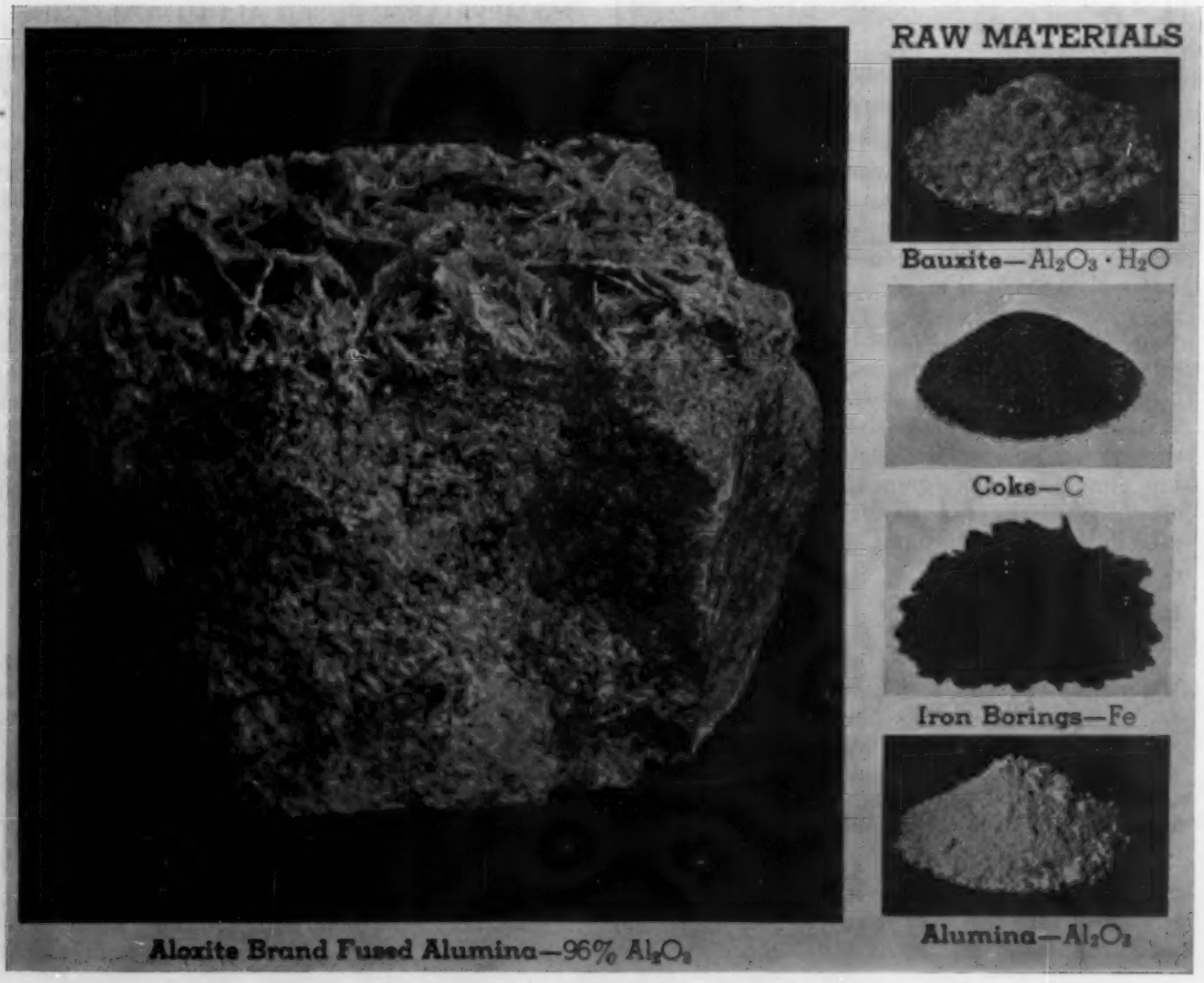
Of course, in polishing operations, particularly in set-up wheel applications, it is essential that the abrasive grain be treated to provide a very clean surface so that a strong bond will be effected between the abrasive grain and the set-up wheel abrasive—either glue or the cold setting cements. To assure a clean surface and good bonding characteristics, grain manufacturers apply a chemical and/or a heat treatment, or both, to provide good adhesion between the grain and the bond employed. In loose grain applications, such as glass bevelling and lithoplate graining, freedom from oil is essential and treatments are applied to accomplish that effect.

## TOUGH FUSED ALUMINUM OXIDE

To produce tough aluminum oxide the furnace operation is essentially the same as with the semi-friable type. The raw material is bauxite but the degree of reduction is such as to produce a material containing 2.90% to 4.00% of titania, figure 5.

As in the case of semi-friable fused aluminum oxide, we can maintain various degrees of toughness by controlled crushing. For example, by controlled crushing we can produce a very sharp type of fused aluminum oxide. The extreme sharpness

**Figure 1**



of this material plus the inherent tough characteristics of the crude material produces a grain which is particularly adapted for use in the manufacture of coated abrasives and it is in this area that the extra sharp type of tough fused aluminum oxide finds its greatest demand.

Again, however, as in the case of semi-friable fused aluminum oxide controlled crushing can produce an abrasive grain which is particularly adaptable to uses requiring a tough abrasive.

Such applications include snagging wheels, both vitrified and organic bonds, for use in steel billet snagging, as a loose abrasive in pressure blasting, and in tumbling operations.

Again, as in the case of semi-friable fused alumina, various surface treatments can be, and are, applied to the tough type to provide the characteristics necessary for specific applications.

## EXTRA TOUGH FUSED ALUMINUM OXIDE

By special furnacing operations, the abrasive grain manufacturer can produce a fused aluminum oxide having extra tough characteristics, figure 6. This type of material is particularly adapted for use in the manufacture of grains to be incorporated in organic bonded wheels used in the snagging of stainless steel billets. In addition, this type of abrasive material, because of its peculiar physical characteristics, has found application in many fields, particularly heavy duty set-up wheel polishing and tumbling operations. And again as in the cases of other types of fused aluminum oxide surface treatments can be applied to provide abrasive characteristics necessary for the application at hand.

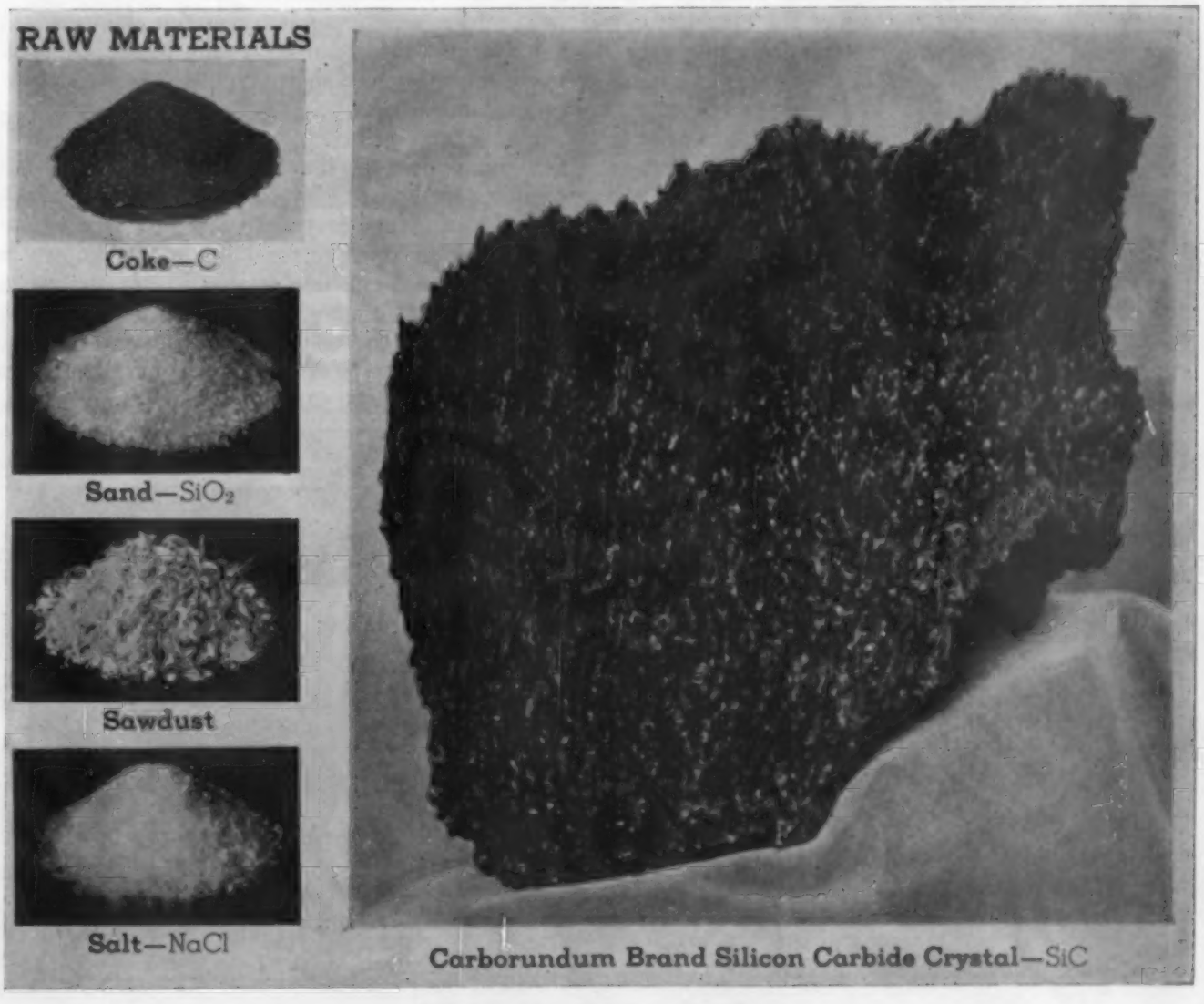
## UNFUSED ALUMINUM OXIDE

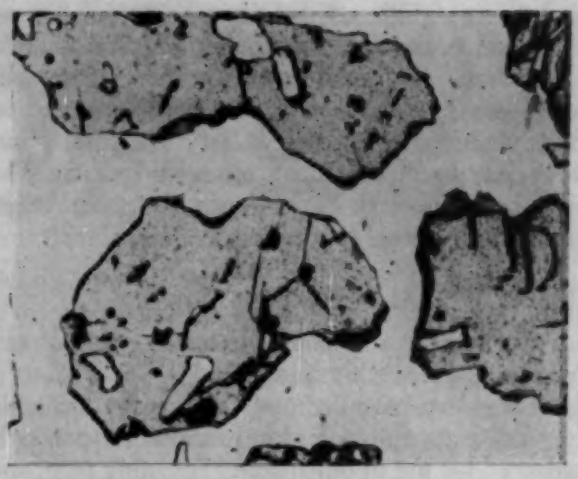
While up to this point we have confined our remarks to fused aluminum oxide, it is well to note that abrasive manufacturers also make available to the trade an unfused aluminum oxide particularly adapted for use in buffing and finishing compounds. These unfused aluminum oxides are especially treated to provide materials varying from high cut and low luster to low cut and high luster.

### Silicon Carbide

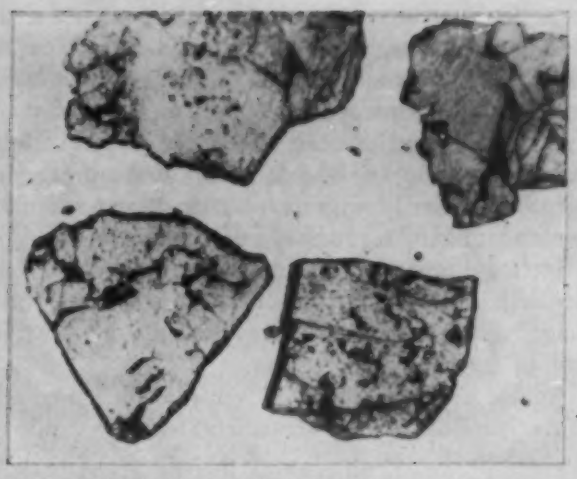
In the manufacture of crude silicon carbide two

Figure 2





3. Friable fused Aluminum Oxide grain.



4. Semi-friable fused Aluminum Oxide grain.

types are generally produced: black silicon carbide, and green silicon carbide, and each has its particular field of application.

Green silicon carbide is a product of the electric furnace in which unadulterated raw materials are used, consequently this product of the electric furnace more closely approximates chemically pure silicon carbide. The physical characteristics of green silicon carbide make it a desirable ingredient in abrasive products particularly designed for grinding hard, brittle materials such as the cemented metallic carbides of modern industry.

Black silicon carbide, on the other hand, contains a higher amount of impurities and the presence of these impurities imparts a certain degree of toughness to the silicon carbide grain.

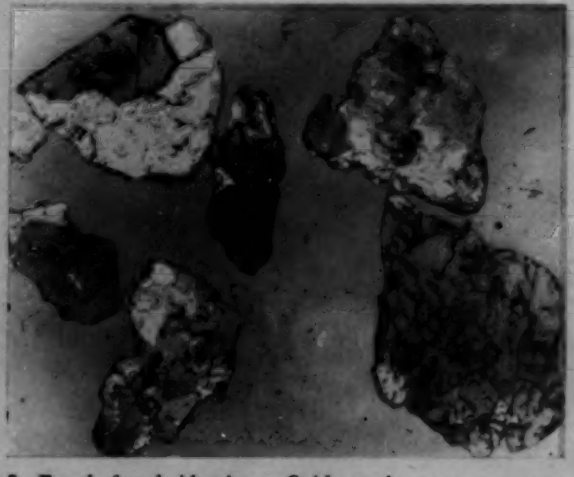
The application of green silicon carbide in abrasive applications is relatively limited, being generally confined to use in vitrified wheels for the grinding of cemented carbide tools and products of a similar nature.

Black silicon carbide on the other hand, has a more diversified application. As in the case of fused aluminum oxide, controlled crushing produces a material for specific applications. For use in coated abrasives and in certain light duty polishing operations, an extremely sharp type of silicon carbide grain is produced.

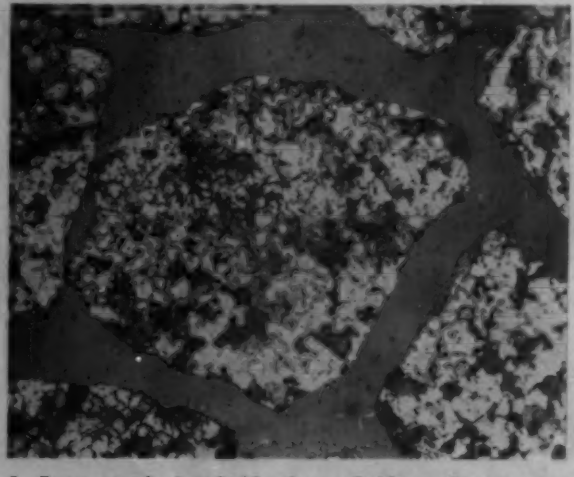
For general grinding and polishing purposes a medium sharp type is manufactured by controlled crushing methods.

And again, for heavy duty snagging wheels and for applications where resistance to breakdown is essential special crushing treatments are applied to give a resultant grain suitable for the intended use.

Again, as in the case of fused aluminum oxide, regardless of the type of crushing, surface treatments are applied to silicon carbide grains to impart capil-



5. Tough fused Aluminum Oxide grain.



6. Extra tough fused Aluminum Oxide grain.

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AS EARLY AS 6000 B.C. Egyptians were using copper in making weapons and utensils. Later bronze, iron, and even steel weapons were made. The edges of these weapons were carefully abraded and honed by a fine-grained sandstone, the forerunner of the famous whetstones. Egyptian paintings indicate that a special quality metal may have been used for the edges of their weapons.

BUTCHERS in the land of the Nile carried a "steel" or sharpening bar attached to their belts. This was used for quick-honing their knives. These "steels" as they are referred to throughout ancient history were bars of a sapphire-like stone. Thus we see the sharpening or finishing of metal is not a recent development. The Egyptians were well acquainted with this method of abrasion.

THE STATELY COLUMNS, pedestals and statues built by the Egyptians were shaped and finished by abrasion. Moreover, Egyptian artistry in working with precious stones and metals indicates a high degree of abrasive skill.

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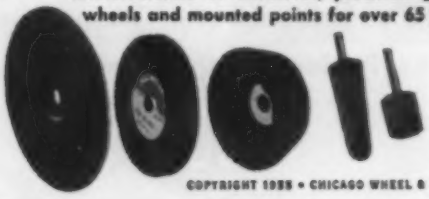

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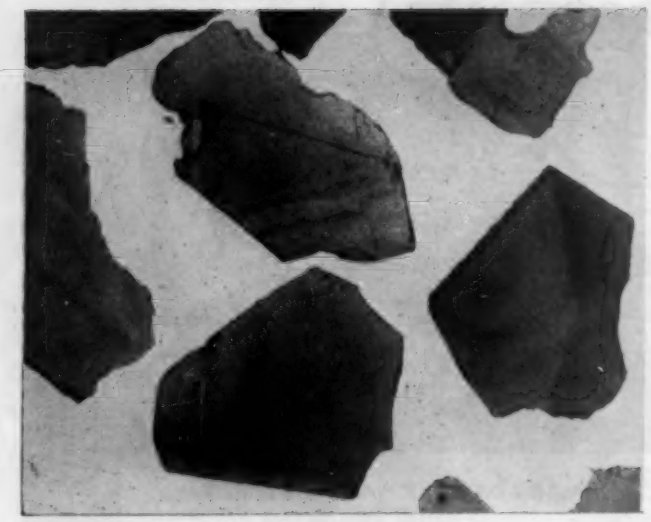

**7. Silicon Carbide abrasive grain.**

larity and/or added toughness as indicated by the end use.

### Quality Control

It is the aim and purpose of all the major producers of abrasive grains to provide to industry products which will meet certain standards of quality, thereby assuring to the consumer a material of reproducible quality, regardless of the source of manufacture. This is particularly true as to the grading or sizing of the various grits of abrasive grains. To this end the major producers of abrasive grains and the major consumers of abrasive grains have subscribed to Simplified Practice Recommendation No. 118 issued and promulgated by the Bureau of Standards of the U. S. Department of Commerce. This specification defines the tolerances allowed in the sizing of abrasive grains, either fused aluminum oxide or silicon carbide, used for polishing purposes or in the manufacture of abrasive wheels. This assures to the consumer that a 36 grit purchased from Producer A will be the same size as a 36 grit purchased from Producer B, assuming that both producers have subscribed to the specification.

In addition, as previously indicated, the abrasive grain producers have applied to their grains certain treatments intended to provide to the consumer optimum abrasive characteristics according to the end use intended.

### Dual Responsibility

The abrasive grain manufacturer has assumed the responsibility of providing abrasive grains having the characteristics necessary to satisfy the demands and requirements of the consumer. Considerable time, effort and technical skill have been expended by the producer to provide to the consumer a quality product suitable for his needs. They provide an engineering service to study customer needs and recommend correct product specifications. It is incumbent on the consumer, therefore, to exercise every precaution to handle and store his abrasive grains in such a manner as to preserve the qualities which the abrasive grain producer has taken such pains to build into his products. It is his responsibility to use the abrasive grain on the applications for which they have been specifically engineered. This cooperative producer-consumer relationship will result in greater returns per dollar spent on abrasive grains. ● ●


**Machines, Wheels, Coolants, Accessories**

**will be described in GRINDING and FINISHING TOOL SHOW ISSUE, AUGUST**

All the exhibitors, products, personnel in attendance, etc. as they pertain to the abrasive indusry will be described and illustrated in the August issue. Don't miss it! See what will be hown at the three big shows in Chicago, Sept. 6-17: The National Machine Tool Show, Amphitheatre; Production Engineering Show, Navy Pier; Coliseum Machinery Show, Coliseum.

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# Disc Grinding For High Production Work

By **Roger N. Perry Jr.**
Technical Service Section
Norton Company, Worcester, Mass.

**". . . modern disc grinders have been developed into high production precision machine tools, designed to perform surface grinding operations on a wide variety of parts on a continuous basis."**

**". . . one of the most important requirements for disc grinding is a strong, accurate, mechanical means of mounting the abrasive discs to the machine plate."**

**". . . where disc grinders are designed for through-feed, continuous operation, the primary duty of the operator is to keep the feeder filled with parts."**

**". . . disc grinding machines have been developed to meet the need for high production surface grinding, particularly where two surfaces must be ground parallel. Practically all materials which can be ground can be disc ground. Double disc grinders, because of their through-feed manner of operation, grind 100% of the working time."**

● PERHAPS the most unusual aspect of disc grinding is the wide variety of work that can be production surface ground. Conventional items include piston rings, coil springs, bearing races, washers, spacers, etc. Some of the more unusual parts finished by this rapidly increasing method of grinding are bathtubs, concrete blocks, tile shapes, and even plastics.

In the metalworking fields, the modern disc grinders have been developed into high production precision machine tools, designed to perform surface grinding operations on a wide variety of parts on a continuous basis. These disc grinders are essentially surface grinding machines which mount on abrasive wheel or wheels, called discs, against a steel plate so that the grinding is performed against the flat side of the disc. Abrasive discs are mounted singly or in pairs opposing each other depending upon the design of the machine.

The five basic types of disc grinders are:
Single horizontal spindle, single end
Single horizontal spindle, double end
Single vertical spindle
Double horizontal spindle, double disc
Double vertical spindle, double disc

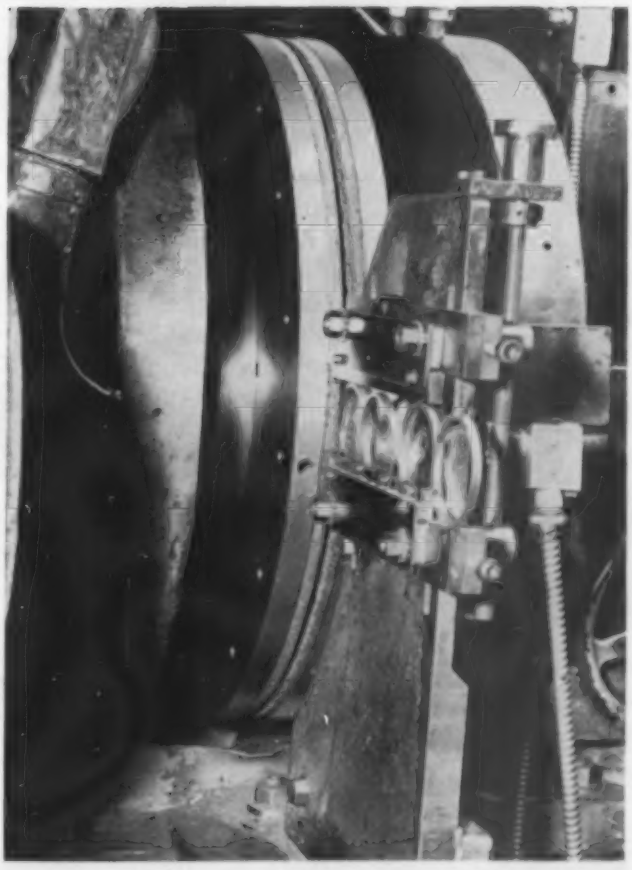
The single horizontal spindle machines are usually of the general purpose type. The smaller models are found in light manufacturing, tool and die, job and maintenance shops for use in rough grinding and finishing a wide variety of materials. The larger machines, mounting discs 20" to 40" in diameter, are used for heavy stock removal as in foundry grind-

ing of castings, grinding ceramics, coil springs and hardware where a flat surface is required.

A good example of the vertical single spindle disc grinder is the so-called tub grinder mounting discs from 30" to 72". In these machines, the work is held against the upper side of the rotating disc. Special work holders are often used to maintain a definite relationship between the ground surface and surfaces previously ground. Grinding on the two types of disc grinders just described is usually done dry although coolant has been used for some specialized work.

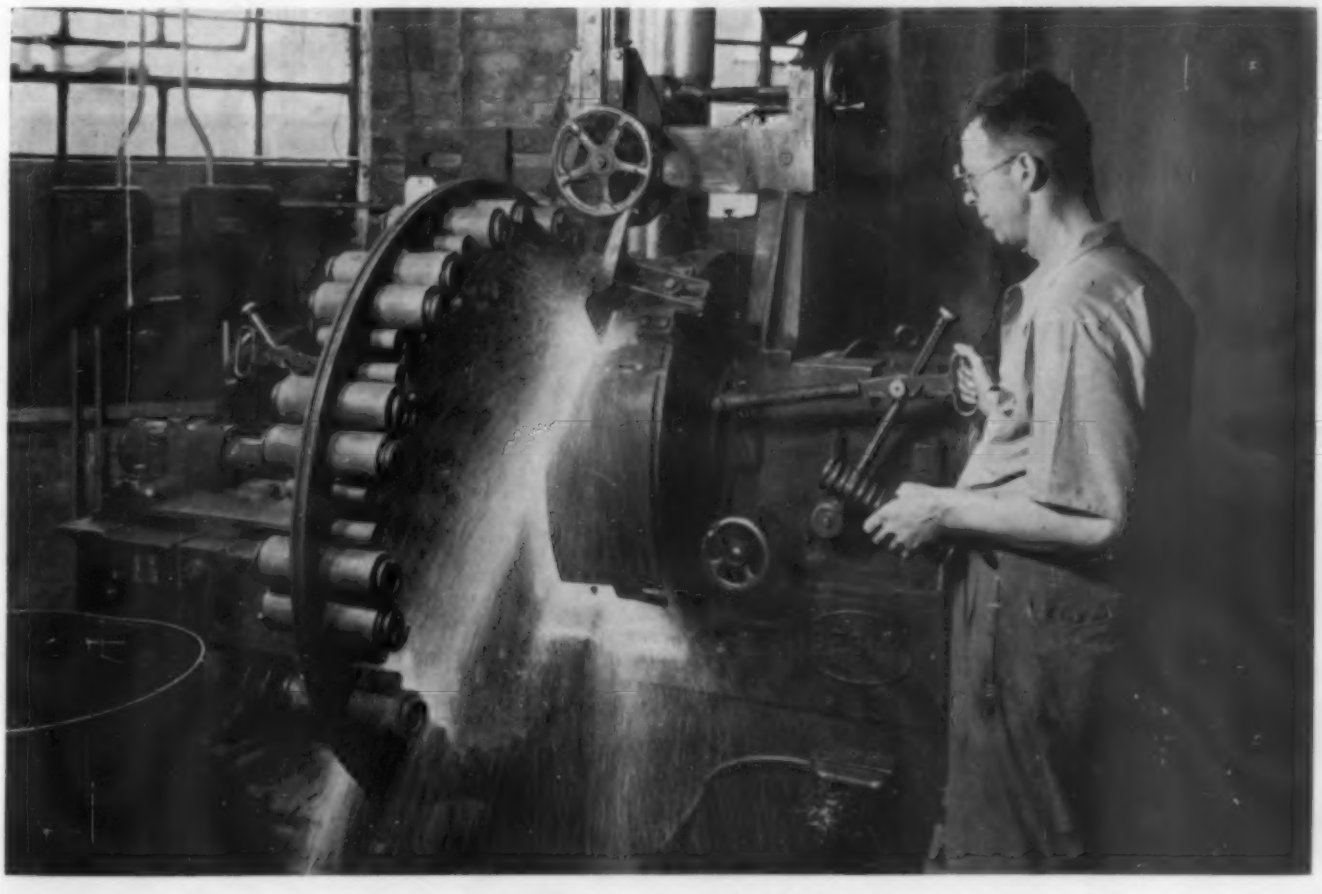
The double spindle grinders, both horizontal and vertical, are essentially precision surface grinding machines which have the advantage of being able to grind two surfaces flat and parallel simultaneously. Another important feature from a production standpoint is that the machine grinds continuously with no down-time for loading.

With double spindle grinders, some sort of work holder must be used to control the feed through the wheels. One type of holder consists of guide bars, narrower in width than the work to be ground, between which the work is supported in its path across the diameter of the discs. Another holder is usually called a "ferris wheel" because of its appearance. The ends of parts like coil springs and automotive valves are customarily ground with this type of



**Piston ring grinding. Note guide bars to hold work passing between discs.**

**Grinding ends of coil springs in a double disc machine using a ferris wheel work holder.**



holder which rotates between the abrasive discs at a uniform rate.

To promote even wheel wear, it is desirable that the work should pass over as much of the wheel face as possible. One problem in using a large diameter disc is that the rate of cut will vary across the face of the disc due to the gradually diminishing surface speed toward the center of the disc. To overcome this change in rate of cut, it is sometimes necessary to make the inner portion of the disc of a softer grade, or hardness, than the outside portion. This is referred to as "composite grades". In addition to promoting a more uniform grinding action, this two-zone wheel tends to eliminate uneven wheel wear.

**Grinding the ends of coil springs in a vertical spindle, double disc machine.**

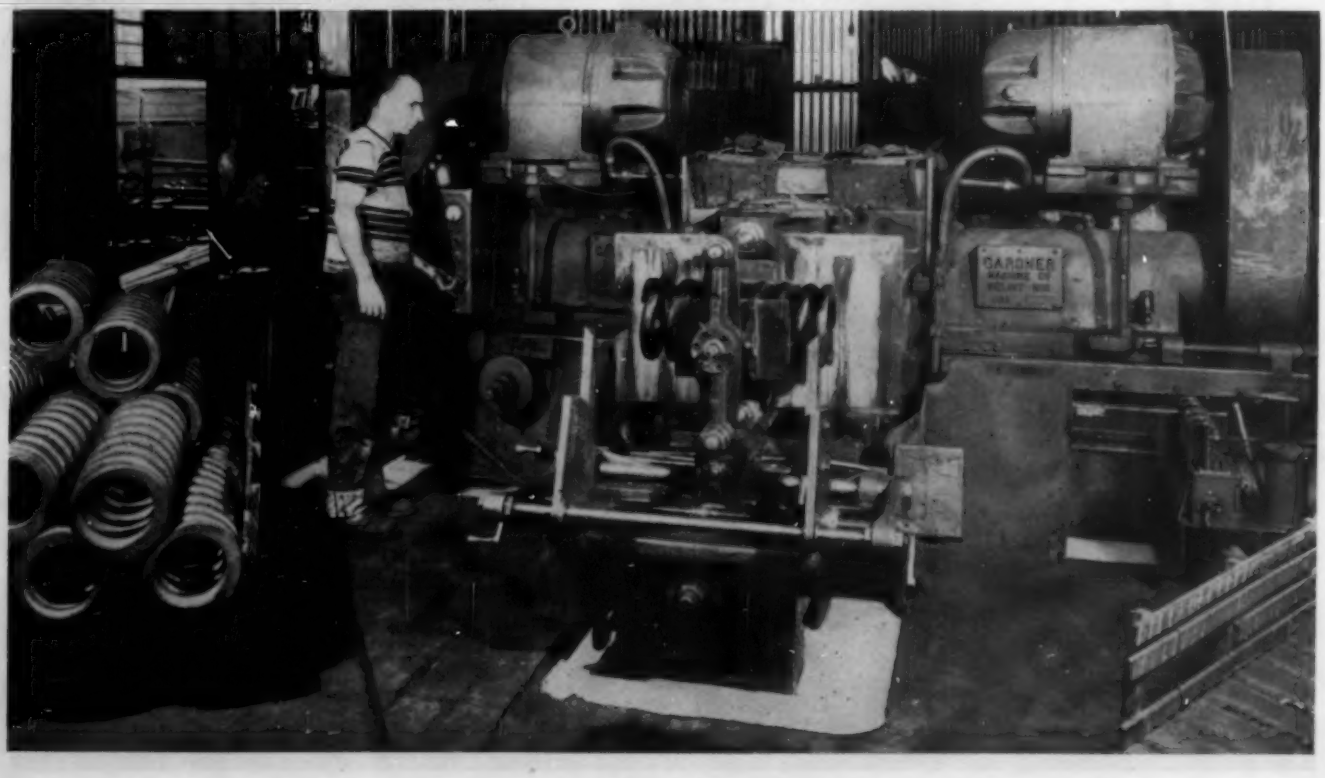
Lapping and disc grinding are very similar in many respects. Lapping will not be discussed in this article. However, in the interest of a clearer understanding of the two processes, these are the basic differences: In lapping, speeds are generally slower, grit sizes of lapping discs are much finer, and work holders must be designed to insure that all parts of the wheel face receive equal amounts of wear to insure a high degree of flatness.

One of the most important requirements for disc grinding is a strong, accurate, mechanical means of mounting the abrasive discs to the machine plate. This is accomplished in several different ways. Nuts inserted in the back side of the disc are one of the most common methods of fastening the discs. In resinoid wheels, the nuts are molded in place. In vitrified wheels, they are anchored in babbitt metal after firing. Discs are sometimes mounted on a steel plate which is vulcanized to the disc.

Inserted nuts in discs must conform to the bolt hole pattern of the machine plate. At one time, there were scores of different patterns on the machines made by several manufacturers. To overcome this confusing situation, the makers of disc grinders adopted a set of standard mounting patterns. These are known as Disc Grinder Manufacturers Specifications, abbreviated DGMS. The adoption of these standards has made it possible for abrasive disc manufacturers to fill orders with much less chance for error and delay. It has also helped customers standardize their stocks.

Where disc grinders are designed for through-feed, continuous operation, the primary duty of the operator is to keep the feeder filled with parts. He

**Grinding the ends of heavy duty railroad springs.**



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also inspects and gages the finished work, making adjustments for wheel wear when required.

Sometimes in high production operations, a team of two or three men is required to operate one machine. One man loads the machine, while the other inspects work and makes machine adjustments.

The operator must also be able to judge when the discs require dressing. This may be at a point when the work shows evidence of burn or when the discs have worn out-of-flat making it difficult to hold size. Of course the ideal condition is one in which the discs break down evenly, giving efficient grinding action and useful life without resorting to dressing.

Disc grinding is done both wet and dry. As with most grinding, coolant is used for fine finish or when there is danger of burning the work. Rough grinding is usually done dry. Water is an excellent coolant but to prevent rust, a soluble oil is almost always added to the cooling water. Finishes of 20 microinches or finer can be obtained in production runs depending upon the material being ground and the coolant used. These finishes are available when using discs in the 80 to 120 grit range.

### Typical Examples of Disc Grinding Applications

A manufacturer of structural tile was faced with the problem of grinding two parallel faces, removing from an eighth to a quarter of an inch of stock, holding the tolerance of finished work to ± 1/64 inch. He now turns out these tile shapes at the rate of 22 per minute using silicon carbide, resinoid bonded abrasive discs on a double spindle grinder.

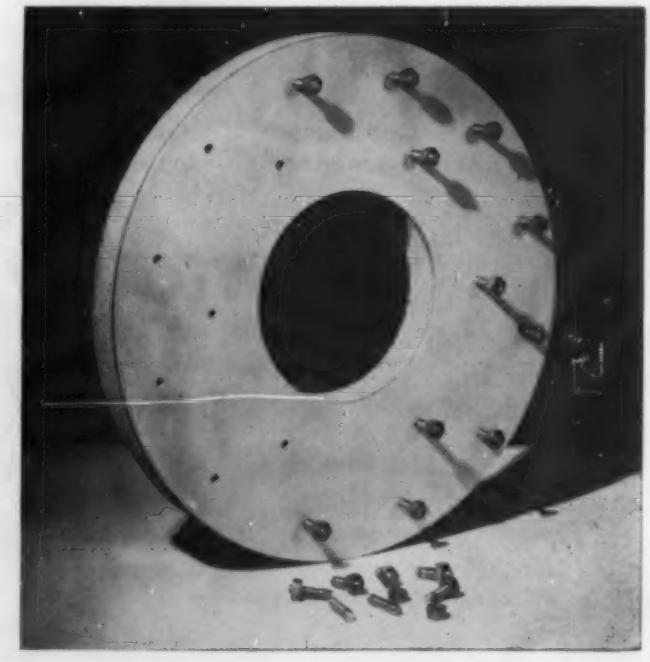
A maker of automotive parts turns out 400 cast iron piston rings per minute on a double spindle machine mounting two 30-in. silicon carbide, resinoid bonded discs. Stock removal is .015-in. per pass and the tolerance is within .001-in.

Another plant, working on ordnance work, had to grind some aluminum discs used as fuse parts. Each disc was 1½-in. in diameter and about 3/32-in. thick. These were ground at the rate of 20,000 in an eight hour day, on a double spindle machine, removing .015-in. of stock per pass. Abrasive discs used were 19 Alundum, resinoid bonded.

A bathtub maker used a single spindle machine, mounting a 42-in. silicon carbide, resinoid bonded disc, to grind the back rim of tubs at the rate of 140 per hour.

**Resinoid bonded abrasive disc with inserted nuts molded in place.**

**Typical abrasive disc. Steel plate is vulcanized to wheel and studs screw into plate.**



**Surface grinding a cast iron cover plate on a single disc, vertical spindle grinder. Weight and steel rod are used to exert down pressure on work.**

**Abrasive discs are dressed with inexpensive steel cutters instead of diamonds.**

**A single, horizontal spindle disc grinder used as a general purpose grinder.**

## Advantages and Limitations of Disc Grinding

Disc grinding machines have been developed to meet the need for high production surface grinding, particularly where two surfaces must be ground parallel. Practically all materials which can be ground can be disc ground. Double disc grinders, because of their through-feed manner of operation, grind 100% of the working time. There is no idle time during loading or unloading of the machine. A good commercial finish can be obtained. Certain parts lend themselves readily to automatic loading and unloading by means of vibrating feeders or other standard feeding devices. Such operations can be made almost completely automatic. Often, two disc grinders are set up in such a fashion that the work pieces from the first machine feed directly into the second machine for final grinding where a second operation is needed because of the amount of stock to be removed or because of finish requirements.

The ability to grind two sides of a workpiece parallel at the same time is perhaps the greatest single advantage of a double disc grinding machine. This can be done to close limits of accuracy. Provided the machine is in proper adjustment, there is little chance that the work will be out of parallel because of warpage or improper holding to a chuck.

Dressing the abrasive laps requires no expensive diamonds. Dressing is done with inexpensive steel cutters. Often dressing is not necessary when the abrasive disc specification is precise as the abrasive will wear at the proper rate to keep the face sharp and free cutting.

There are, of course, some limitations in the practical use of disc grinders. They will not give the same high degree of finish and flatness that is possible from a lapping machine. Often, however, the disc machine will remove most of the stock on a part, leaving only the final finishing to be done on the lapper.

While single face disc grinders are quite suitable for grinding a small number of similar parts, double spindle double disc grinding machines are not practical unless the number of parts to be ground is high. Special work-holding fixtures are often required to hold and feed the work while it is being ground.

Disc grinding has taken its place among the other accepted methods of metal finishing. In applications where high production is essential and dimensional requirements are within the capabilities of the equipment, disc grinding can be a profitable answer to the surface grinding problem. ● ●

**"Does very precise work, I understand."**

# Centerless Grinding Values Established With Standard Data . . . Part 3

by **E. A. Cyrol,** president
E. A. Cyrol & Co.,
Management Consultants,
Chicago, Ill.

## What Standard Data Will Do For You

- **provide good production standards**
- **eliminate misunderstanding between management and union**
- **establish standards on short-run production**
- **shorten lengthy time studies**
- **increase effectiveness of wage incentive programs**

This is Part 3 of a series of articles on Standard Data by E. A. Cyrol. This article deals with standard data established for centerless grinding.

Mr. Cyrol is a director of the Federal Tool Corp., Chicago; director, Industrial Management Society; and is listed in Who's Who in the Midwest, Who's Who in Business and Industry, and Who's Who in Arbitration. He has written many technical papers and articles on Standard Data and is recognized as an outstanding authority on the subject.

IN THE PRECEDING two articles, we have endeavored to point out the many advantages recorded standards have over direct timestudy. Recorded standards are impersonal, more correct and ageless. In addition they offer a sound and broad foundation for recognizing individual accomplishments, increasing profits, and meeting competition.

Part one of the series explained how standard data for external plunge grinding was established, and Part two dealt with Oscillating Grinding Standards.

Production standards for centerless grinding are calculated in this article through the use of the standard data work sheet. These examples are intended to serve as guides to the prescribed method of determining a production standard through the standard data method.

The data established here is based on a Cincinnati No. 2 centerless grinder.

### How to Use the Work Sheet

The Standard Data Work Sheet must be carefully filled out with all pertinent information regarding the operation concerned. The Work Sheet is filed for

future reference after the standard has been calculated and transferred to the shop routings and payroll records.

In the event a standard is challenged, the Work Sheet, along with all necessary pertinent and supporting data, will be the basis of any investigation of the standard.

When additional elements, not included on the Work Sheet, are found to be necessary, a time study should be taken to obtain this information. This additional element should be recorded in the write-up for future reference and development of data for this element.

1. Fill in upper left hand corner of Work Sheet with Part Number, Operator's Number, Part Name, Machine Type, Machine Number, Department Number, Operation Description, O.D. Size, Length and Tolerance.

2. Transcribe time values for handling and machine elements, listed under type of machine used, to right hand column. Refer to Table No. 1 for time values for "Pick up," "Aside," "Position," and "Remove." If the routing calls for a special fixture or arbor to be used, a clocked cycle will have to be taken and that time value noted on the Work Sheet.

If an automatic loader is to be used, the values for "position piece in Machine" and "remove piece from machine" are not used. If an automatic loader is not used, the values for "Position piece in loader," "Down Loader," "Up Loader," and "Remove piece from loader" are not used.

The time values "Stop coolant," "Stop regulating wheel," "Up splash guard," "Down splash guard," "Start regulating wheel" and "Start coolant" are allowed for all jobs running on a No. 4 Cincinnati, and for all arbor jobs. These values are allowed on the No. 2 Cincinnati only on request of the foreman.

3. Allow "load and unload piece to and from table" value if needed. This value is usually allowed only for pieces weighing 5 pounds or less.

4. Fill in and compute the Grinding Time by referring to Table No. 2 for time value. To find the time required to remove .001 stock, multiply by the number of .001's removed. The grinding time should be written in the right hand column of Work Sheet.

5. Fill in "Lap time" value. Refer to Table No. 2 for "Lap Out Time" value.

6. Fill in the "Wheel dress allowance" from Table

CENTERLESS GRIND STANDARD DATA WORK SHEET
(End Feed Only)

| | |
|---|---|
| Part no. 3482 | Oper no. 30 |
| Part name Pin | |
| Machine # 2 C. | Dept. no. 24 |
| Operation desc. GRIND 1.654 | Tol. ±.000 .001 |
| O.D. size | Length 3.250 |
| Weight 2½ | |
| Grinding wheel | Width 6 |
| Regulating wheel RPM | |
| Ejector | Arbor no. |

Table # 1
Piece From Table To Machine

| Weight | Pick Up | Aside |
|---|---|---|
| 0# - 1# | .033 | .022 |
| 1.1 - 5 | (.040) | (.022) |
| 5.1 - 10 | .045 | .022 |

Skid to Mach.

| Weight | Pick Up | Aside |
|---|---|---|
| 5.1# - 10# | .059 | .035 |
| 10.1 - 20 | .073 | .047 |
| 20.1 -50 | .093 | .058 |

Position & Remove # 3 & 4

| Weight | Position | Remove |
|---|---|---|
| 0 -3# | .027 | .025 |
| 3.1 -4# | .030 | .028 |
| 4.1 -7 | .035 | .030 |
| 7.1 -11 | .040 | .035 |
| 11.1 -19 | .045 | .040 |
| 19.1 -30 | .050 | .045 |

Position & Remove #2

| Weight | Position | Remove |
|---|---|---|
| 0# - 1" | .026 | .026 |
| 1.1 - 2 | .040 | .026 |
| 2.1 - 5 | (.051) | (.026) |
| 5.1 - 10 | .060 | .026 |

Remarks:

| Handling Elements | (#2) | #3 | #4 | Minutes |
|---|---|---|---|---|
| Pick up piece | Table #1 | | | .040 |
| Position piece in machine | Table #1 | | | .051 |
| Position piece in loader | | .021 | | |
| Down loader | | .034 | | |
| Advance regulating wheel | (.027) | .034 | .057 | .027 |
| Retract regulating wheel | (.017) | .020 | .033 | .017 |
| Up loader | | .034 | | |
| Remove piece from machine | Table #1 | | | .026 |
| Remove piece from loader | | .017 | | |
| Aside piece | Table #1 | | | .022 |
| Stop coolant | .023 | .023 | .023 | |
| Stop regulating wheel | .025 | .025 | .025 | |
| Up splash guard | .023 | .023 | .023 | |
| Down splash guard | .023 | .023 | .023 | |
| Start regulating wheel | .025 | .025 | .025 | |
| Start coolant | .023 | .025 | .028 | |
| Load and unload arbor | | | | |
| Remove piece when using roller | .010 | | | |
| Load and unload pcs. to & from skid | | | | |
| Gaging time | .046 | .046 | .046 | |
| Min. per .001 x no. of .001's removed: .032 x 8 | | | | .256 |
| Lap out time | | | | .055 |
| Wheel dress allowance | | | | .094 |

| | | |
|---|---|---|
| By A.B.C. | Total minutes per piece | .588 |
| Date 2-15-55 | Personal & unavoidable 11.1% | .065 |
| | Total production time | .653 |
| | 20% Incentive factor | .131 |
| | Standard minutes per piece | .784 |
| | Standard hours per 100 pieces | 1.307 |
| | Pieces per hour | 76.5 |

No. 2. When removing .005 stock or less use ½ the value for the 6" width, type 1 and Type 11.

7. Write in any other information needed, under "remarks."

8. Add the extensions in the right hand column to determine the total minutes per piece.

9. Add 11.1% for personal and unavoidable delay allowances. (These should be determined for each group of equipment.)

10. To the resulting total, a 20% incentive factor is added for the bonus potential for an operator achieving the expected output.

11. Finish the computation for total minutes per piece, hours per hundred pieces, and pieces per hour. (Under incentive conditions, it is anticipated that the operator will produce 20% more than this.)

If no incentive is used, the 20% can be considered as an adjustment factor to have the standard reflect the amount of work that can be expected under day-work conditions.

## Element Description

| | Cincinnati Machine #2 | #3 | #4 |
|---|---|---|---|
| 1. Pick up piece. This element includes the time allowed to pick up a piece from a work-table or skid and move it to a proximity of the work rest blade or loader. | See Worksheet | | |
| 2. Position piece in machine. This element includes the time allowed to position a piece on the work rest blade, between the grinding wheel and regulating wheel. (Or on the work rest blade and roller support on the No. 2.) | See Worksheet | | |
| 3. Position piece on loader. This element includes the time allowed to position a piece on the loader arms. | | .021 | .021 |
| 4. Down loader. This element includes the time allowed for the operator to actuate the loader air control valve and for the loader to move down to the work blade. | | .034 | .034 |
| 5. Advance regulating wheel. This element includes the time allowed to turn the infeed hand wheel counter-clockwise until the work touches the grinding wheel. | .027 | .034 | .057 |
| 6. Retract regulating wheel. This element includes the time allowed to turn the infeed hand wheel clockwise until the work is approximately 1/16" to 1/8" clear of the grinding wheel. A hand lever is used on the No. 2 machine and it is pulled up to a full clear position. | .017 | .020 | .033 |
| 7. Up loader. This element includes the time allowed for the operator to actuate the loader air control valve and for the loader to slide up to the top loading position. | | .034 | .034 |
| 8. Remove piece from machine. This element includes the time allowed to remove the piece from the work rest blade. | See Worksheet | | |
| 9. Remove piece from loader. This element includes the time allowed to remove a piece from the loader arms. | | .017 | .017 |
| 10. Aside piece. This element includes the time allowed to move a piece from the work rest blade area or loader arm area and place it on a work table or in a skid. | See Worksheet | | |
| 11. Stop coolant. This element includes the time allowed to shut off the coolant flow. | .023 | .023 | .023 |
| 12. Stop regulating wheel. This element includes the time allowed to press the stop button for the regulating wheel. | .025 | .025 | .025 |
| 13. Up splash guard. This element includes the time allowed to lift the front splash guard up to facilitate unloading. | .018 | .018 | .018 |
| 14. Down splash guard. This element includes the time allowed to move the front splash guard down before grinding. | .023 | .023 | .023 |
| 15. Start regulating wheel. This element includes the time allowed to press the start button for the regulating wheel. | .025 | .025 | .025 |
| 16. Start coolant. This element includes the time allowed to start the coolant flow. | .030 | .030 | .030 |

### Type I Grind

1. Use when grinding a diameter in one grind, and have a tolerance of less than .001.
2. Use when a finish of 32 micro or better is required.
3. Use when grinding a thin walled piece.

### Type II Grind

1. Use when the operation is classed as a rough grind or semi-finish grind, that will be followed by a finish grind.

**In our work as management consultants, specializing in the field of work measurement in particular and factory management in general, we are often asked to train time study personnel in the development and use of standard data for the establishment of production standards. Although most books on time study do not treat the ultimate use of time studies as raw material for the construction of standard data, there are several excellent books that do describe this phase of the art of determining production standards. Two of the best of these are "Time Study for Cost Control" and "Charting Time Study Data" by Phil Carroll, Jr.**

**Even the best of the books that are available, however, describe the techniques but do not demonstrate by example how standard data is developed and utilized in the factory.**

**These articles attempt to help fill this gap as far as the development of standard data for grinding operations is concerned.**

2. Use when the diameter has a total tolerance greater than .001.

The wheel dressing allowance is based on the average pieces per dressing for each diameter range and the following wheel dressing values:

**6″ wheel**

Type I—4.50 min.

Type II—2.48 min.

**1½″ wheel**

Type I—2.07 min.

When removing .005 stock or less use ½ the value for the 6″ width, Type I and Type II grinds.

## Personal & Unavoidable Delay Allowance Computation

The 11.1% delay allowance was determined from eight hour delay time studies. The personal time allowed is shown below. The total is expressed as a percentage of the available working time per shift. It is determined by obtaining the total delay minutes allowed and subtracting from the minutes per shift (480). The percentage is then computed by dividing the minutes allowed by this remainder (which is the available working time).

**Personal** **33.00 minutes**

The personal time allowed includes two 10 minute coffee breaks

**Unavoidable Delay** **15.00 minutes**

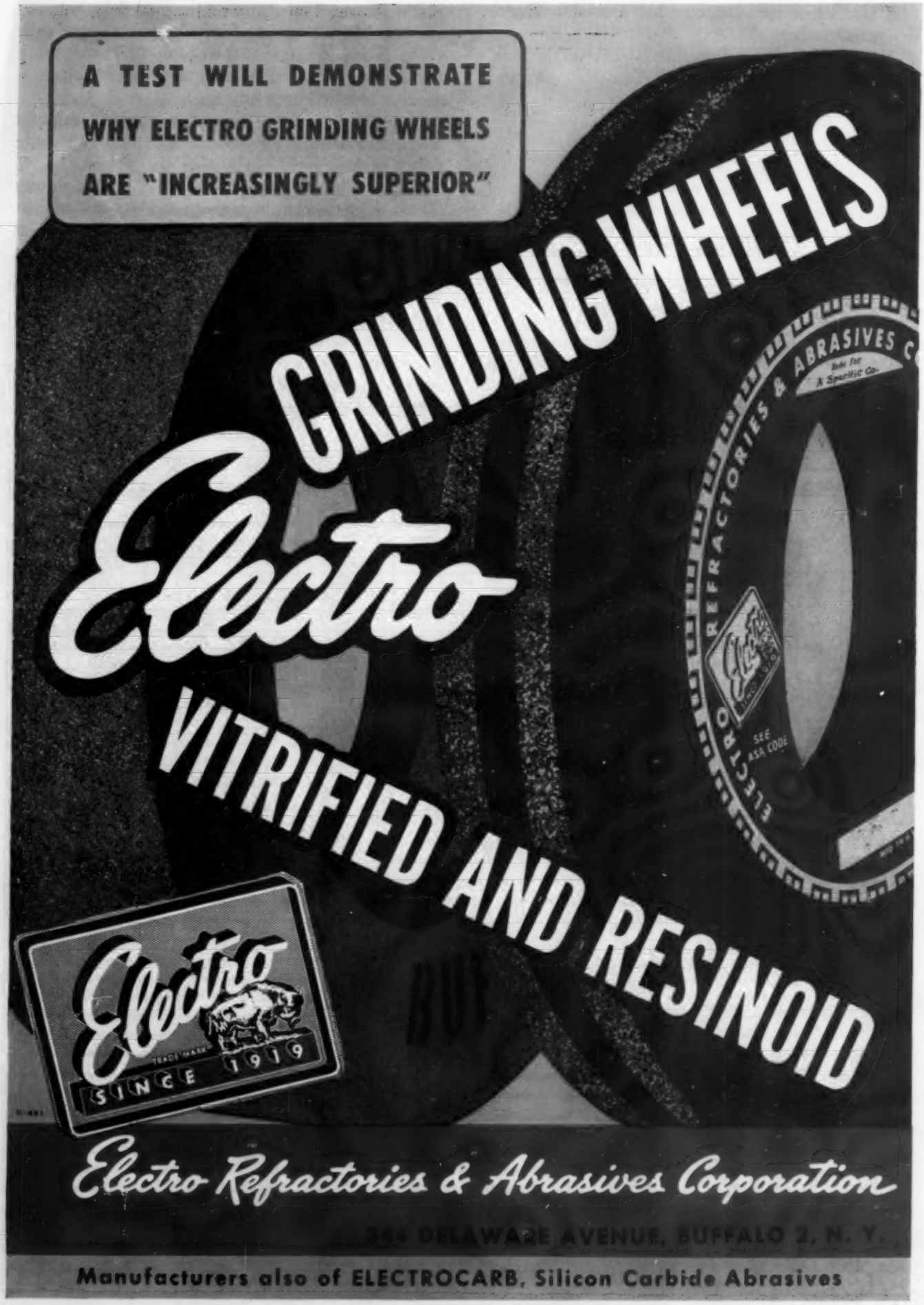
These delays occur throughout the day and consist of receiving instructions from the foreman, group leader, or set up man, interference from or assistance to truckers and material handlers, adding skid sections and cardboard separators, trips to the inspection bench, adding coolant to the machine and work area, mark time card and tools out and away.

$$\frac{48}{480.0 - 48.00} = 11.1\%$$

Total 48.00 minutes

TABLE #2

| Diameter | | Min. To Remove .001 Stock Off Dia. | | | | Lap Out Time | Wheel Dress Allow. | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | #3 & #4 Cincinnati | | #2 Cincinnati | | | Type 1 | | | Type 11 |
| Over | Thru | Type 1 | Type 11 | Type 1 | Type 11 | | 6" W | 1½" W | 2 Dia. | 6" W |
| | .750 | .0080 | .0054 | .010 | .007 | .035 | .053 | .024 | .059 | .029 |
| .750 | 1.000 | .0107 | .0072 | .018 | .012 | .040 | .060 | .028 | .067 | .033 |
| 1.000 | 1.250 | .0134 | .0091 | .021 | .014 | .045 | .073 | .033 | .081 | .040 |
| 1.250 | 1.500 | .0160 | .0108 | .027 | .017 | .050 | .085 | .039 | .094 | .047 |
| 1.500 | 1.750 | .0187 | .0131 | .032 | .020 | .055 | .094 | .043 | .104 | .052 |
| 1.750 | 2.000 | .0214 | .0144 | .037 | .024 | .060 | .102 | .047 | .114 | .056 |
| 2.000 | 2.250 | .0241 | .0167 | .042 | .027 | .065 | .110 | .050 | .122 | .060 |
| 2.250 | 2.500 | .0268 | .0180 | .046 | .029 | .070 | .118 | .054 | .132 | .065 |
| 2.500 | 2.750 | .0294 | .0198 | .051 | .033 | .075 | .125 | .058 | .140 | .069 |
| 2.750 | 3.000 | .0321 | .0215 | .056 | .036 | .080 | .132 | .061 | .147 | .073 |
| 3.000 | 3.250 | .0348 | .0234 | .060 | .038 | .085 | .141 | .065 | .156 | .078 |
| 3.250 | 3.500 | .0375 | .0251 | .065 | .040 | .090 | .150 | .069 | .167 | .083 |
| 3.500 | 3.750 | .0402 | .0270 | .069 | .043 | .095 | .167 | .077 | .185 | .092 |
| 3.750 | 4.000 | .0428 | .0287 | .074 | .048 | .100 | .180 | .083 | .200 | .099 |
| 4.000 | 4.250 | .0455 | .0306 | | | .105 | .188 | | | .103 |
| 4.250 | 4.500 | .0482 | .0323 | | | .110 | .205 | | | .113 |
| 4.500 | 4.750 | .0507 | .0342 | | | .115 | .225 | | | .124 |
| 4.750 | 5.000 | .0535 | .0354 | | | .120 | .237 | | | .131 |
| 5.000 | 5.250 | .0562 | .0378 | | | .125 | .250 | | | .138 |
| 5.250 | 5.500 | .0588 | .0395 | | | .130 | .265 | | | .146 |
| 5.500 | 5.750 | .0615 | .0414 | | | .135 | .280 | | | .155 |
| 5.750 | 6.000 | .0642 | .0431 | | | .140 | .321 | | | .177 |
| 6.000 | 6.250 | .0668 | .0449 | | | .145 | .346 | | | .192 |
| 6.250 | 6.500 | .0695 | .0467 | | | .150 | .375 | | | .207 |
| 6.500 | 6.750 | .0722 | .0486 | | | .155 | .375 | | | .207 |
| 6.750 | 7.000 | .0749 | .0503 | | | .160 | .409 | | | .225 |
| 7.000 | 7.250 | .0776 | .0521 | | | .165 | .409 | | | .225 |
| 7.250 | 7.500 | .0803 | .0539 | | | .170 | .450 | | | .248 |
| 7.500 | 7.750 | .0829 | .0557 | | | .175 | .450 | | | .248 |
| 7.750 | 8.000 | .0856 | .0575 | | | .180 | .450 | | | .248 |
| 8.000 | 8.250 | .0883 | .0593 | | | .185 | .450 | | | .248 |
| 8.250 | 8.500 | .0909 | .0610 | | | .190 | .500 | | | .276 |
| 8.500 | 8.750 | .0936 | .0628 | | | .195 | .500 | | | .276 |
| 8.750 | 9.000 | .0963 | .0646 | | | .200 | .563 | | | .310 |
| 9.000 | 9.250 | .0989 | .0661 | | | .205 | .563 | | | .563 |
| 9.250 | 9.500 | .1015 | .0675 | | | .210 | .563 | | | .563 |
| 9.500 | 9.750 | .1042 | .0689 | | | .215 | .563 | | | .563 |
| 9.750 | 10.000 | .1079 | .0718 | | | .220 | .643 | | | .354 |




Encircle No. 211 on card opposite Page 68

". . . a new, sharp, pointed diamond tool, traversed at the same speed as the previous tool, which had a small, flat land worn into the point, will produce a very rough and coarse finish (diamond threads) and will not hold size and shape."

**NOTE: Mr. Bley is well known in industrial circles for his past work with industrial diamonds, tool design, and truing and dressing methods. Until recently he was engaged in the manufacture of diamond products: circular and reciprocating diamond saw teeth, diamond core drills and a complete line of diamond truing and dressing tools. He has been actively engaged in research and engineering and brings to diamond problems many years successful, practical experience. He is now organizing a diamond tool consulting service.**

# How to Avoid Trouble When Dressing and Truing With Diamonds

By **F. M. Bley,** Consulting Diamond Engineer

IN the maintenance of diamond truing and dressing tools interesting observations can be made on the used tools which are returned to the tool crib. The analysis formed by the appearance of the retired tools can determine the type of care that was given to them, the manner in which they were used and the approximate life cycle that was derived from them.

Yet, aside from the appearance which may classify the usage of the tool, there are many hidden factors which may have influenced the career of the diamond tool and thus may have labeled it success or failure. Of the many requisites for correct usage of the diamond truing and dressing tool, a few are: solid mounting at correct location; overhang; drag-angle and side tilt; occasional rotation of diamond; coolant versus dry dressing; control of traverse; contact area; efficiency cycle of the tool.

In line with human nature, we are all likely to make various accusations as to the cause for difficulty without being able to find out the real reason and, what's even more important, what can be done about it.—For purpose of illustration, let's make up a little story which could be true, and which could perplex many shops and baffle a good many old-timers:

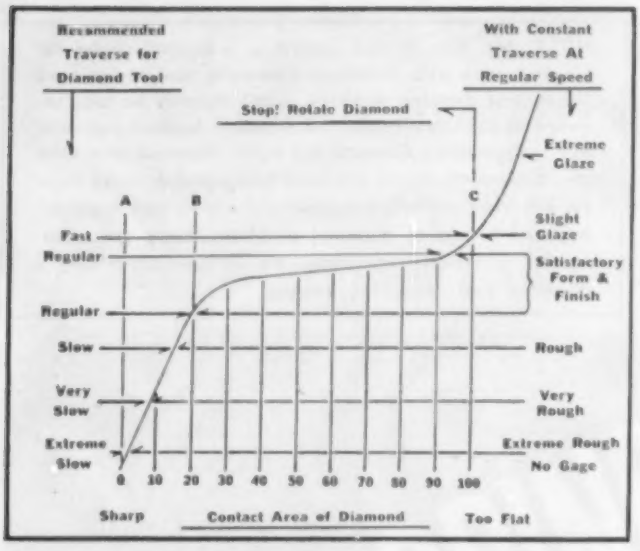
Joe just returned to his machine to learn that—the other shift had to replace the diamond and had trouble, in fact, they produced nothing but "rejects". They had to do so much dressing that they wore the wheel out and had to replace it with a new one!

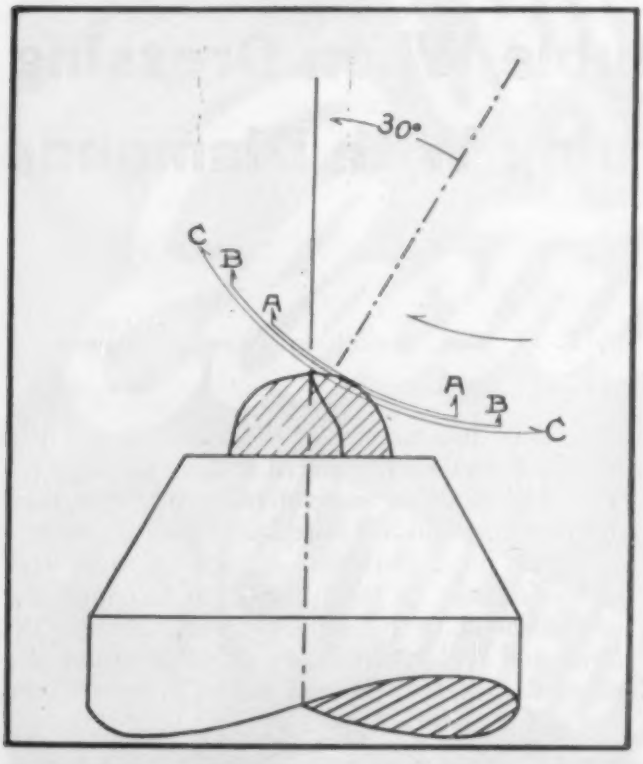
Joe was not a greenhorn at grinding, so he went to his foreman for a requisition to exchange that soft diamond, as he definitely could not get the finish and couldn't hold size. After two more diamond tools were exchanged and tried, the situation was still the same.

"That wheel must have soft spots," said Johnny from the other machine, "it happens to me too, every once in a while—or, maybe the crib had it tagged with the wrong label." Another wheel was mounted on the machine with uniform, identical, bad results!—Well, it could be a variation in the piece parts!

Cut-off department confirmed that the same bar stock (not even the other end) was used, the same which previously produced perfect piece parts.

Something must have gone wrong in heat treat with that new "super hard" method! "It may be that the spindle head bearing that may be on the 'Fritz' again," somebody suggested. Promptly, the machine maintenance department was summoned and although they insisted that the spindle bearing was pretty good, with everyone anxious to re-




establish the production line, the machine was ordered torn down for overhauling. Whether that project took several hours, or a few days.—

Isn't it a shame, that actually, there was nothing wrong with anything?

The only thing that really changed from the original satisfactory condition was—**the contact area of the diamond tool point!**

When a new diamond is used, or an old diamond is rotated into an unused position, the contact area on the diamond point may be practically nil and therefore may require radically different handling during the truing and dressing cycle in order to get satisfactory results.

A new, sharp, pointed diamond tool, traversed at the same speed as the previous tool, which had a small, flat land worn onto the point, will produce a very rough and coarse finish (diamond-threads), and will not hold size and shape.

Only an extremely slow traverse during the dressing of the wheel, will compensate for the minute contact area of a new, sharp diamond or of an old diamond, freshly rotated to a new, unused portion of a sharp point.

This extremely slow traverse is gradually speeded up as the contact area of the diamond enlarges and is then maintained at the ideal traverse speed during the great portion of the life cycle in a specific diamond set up.

Eventually, the contact area of the diamond becomes so large that the dressing action of the diamond glazes the wheel regardless how fast the traverse is speeded up, at which time it becomes necessary to rotate the diamond (usually a ¼ turn) to a new, unused position, after which the entire cycle is repeated.

After the diamond point is worn all around, the Dragangle is changed to the other extreme and manner of use continued. ● ●

# Polishing Metal With Rubber-Bonded Wheels Can Cut Polishing Costs

AS a result of extensive experiments in field performance tests, a soft rubber polishing wheel has been developed which solves many tough problems at big savings. Unlike the ordinary polishing wheel, this new type is made of a special soft rubber bond, impregnated with five different types of polishing compound; nothing need be added to the face of the wheel for the polishing operation and no setting up is required. This type wheel can be used right down to the smallest flange.

Due to the nature of the bond which itself acts as a burnishing or polishing agent in addition to the grain in the wheel, it is possible to eliminate in some cases the "in between" polishing operations usually required with "set-up" wheel methods. While soft rubber polishing wheels in their newest form are not a cure-all for all polishing ills they definitely simplify many polishing jobs. Difficult shapes, irregular and odd sizes of fabricated materials are readily polished. No special equipment is required for the use of soft rubber polishing wheels. They fit bench and floor stand grinders of average speed. As a matter of fact, this new soft rubber polishing wheel delivers greatest efficiency when surface speeds do not exceed 4,000 s.f.p.m. This is exactly contrary to the usual procedures in polishing. In the majority of cases the use of this product combines most polishing operations ordinarily described as roughing, greasing and finishing. Soft rubber polishing wheels handle all operations in one. The only exception being where a rag wheel is needed to get the highest possible degree of polish.

Contrary to the usual set-up polishing practice it is not necessary to exert heavy pressure with this new type of wheel to gain full efficiency. For that reason it is in great favor with operators; its use is not tiresome. Objectionable dust conditions are greatly reduced. Just enough pressure to hold the work securely to the wheel is required.

Any coolant that is not a solvent of rubber can be used. This is a highly desirable feature in polishing work for heat might distort the piece being polished. Water or water and soda solution are ideal. They completely eliminate the heating factor in polishing.

All types of materials can be handled with this soft rubber polishing wheel, such as brass, aluminum, copper, monel stainless titanium and the alloys of nickel and bronze. Manufacturers of this type of wheel are making them in a wide selection of grain sizes which permit their usage from semi-grinding operations where several thousandths of an inch must be removed to the finest of lapping operations. The metals to be polished may be in the form of light castings, strip plate and wire. Such items as surgical instruments, kitchen utensils, store fixtures, automobile accessories, hardware, engraving plates, textile machines, tools, jigs, fixtures, and many others. Much of the hand drudgery in the finishing of cavity dies, small tools, et cetera, may be eliminated by the use of this new material.

Manufacturers of perishable tools are finding wide usage for soft rubber polishing wheels for finishing twist drills, cutters, reamers where they formerly used hard bonded wheels followed by a leather setup. The operations have been combined using one soft rubber polishing wheel.

Manufacturers of stainless steel equipment have found this wheel ideal for blending operations, particularly in food handling equipment where it is necessary to blend out a rough ground weld.

Data through courtesy of Chicago Wheel & Mfg. Co., Chicago, Ill. • •

"Well, well! See you finally landed in the chips, eh, Johnson?"


Lusol K-7 means MORE GRINDING BETTER GRINDING AT LOWER COST

A TRANSPARENT ALL-CHEMICAL SOLUTION FOR GRINDING

Lusol K-7 is a new all-chemical liquid concentrate designed for a wide variety of grinding operations. It is recommended for use on all steels and is particularly suited for cast and malleable irons, titanium, carbon, rubber, ceramics and plastics. Instantaneously soluable in any water, hard or soft, it forms a clear, transparent, colorless solution that resists contamination, settles chips super-fast, and remains clear after repeated use. It is non-foaming and runs absolutely flat under all conditions. It provides maximum rust protection for all ferrous metals, including cast and malleable irons. It maintains clean wheels at all times. They just don't load up when you use Lusol K-7. For better grinding every time, use Lusol K-7. Write for complete information.

. . . BETTER PRODUCTS FOR BETTER METAL WORKING

F. E. ANDERSON OIL CO., INC.

PORTLAND, CONNECTICUT

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# Carrier Corporation Saves $48,000 in Reclamation or Salvaging of Cutting Tools

By **Terence F. Dundon,** Superintendent
Perishable Tools & Supplies
Machinery & Systems Division
Carrier Corporation
Syracuse, New York

● IN 1954, by the centralization of our cutter and tool grinding departments we were able to save $48,000 in reclamation or salvaging of cutting tools. Included in this group was a large percentage of carbide tools.

We also manufactured 2890 first run cutting tools which were produced at competitive prices. Price alone was not the main factor, but we were able to start production sooner and work out any bugs in the design of the cutting tools. In many instances we were able to have our first run cutting tools ready

**Display cabinet used by our operators to obtain technical information relative to their work. Technical data of other nature is also available and used plantwise. Person standing in corner is Terence F. Dundon, superintendent.**

within three to ten days; this is a very important aspect in manufacture costs. The savings, apart from the time element, amounted to $8169, which gave us a total saving of $56,169. The program not only involved reclamation work and the manufacture of first run tools, but also the regrinding of production cutting tools. The total number of cutting tools reground in 1954 numbered 276,000 tools. This included: single point and carbide tools, spot facers, back facers, taps, drills, reamers, milling cutters, carbide and H.S. inserted tooth cutters, plus a wide range of special design tools.

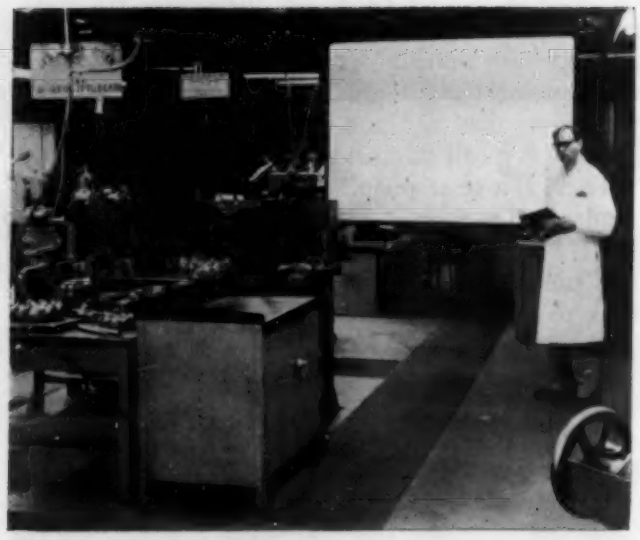
The centralizing of the regrinding of cutting tools is an important move towards cost reduction. A cutting tool is only as good as it is designed and, therefore, only as good as it is reground. It is not a question of how much it costs to regrind the tool as, how many pieces per grind are you able to obtain from a reground tool. For example, in studying the cost of a drill or a regrind, it is not the initial price of the drill itself, or the regrind, but the number of holes per regrind that you are able to obtain. In other words, when purchasing a drill you actually purchase holes, this also applies to regrinding of any type of cutting tool.

Our program was not successful because of what we knew as a group, but because we were mindful of what we didn't know, thus we took full advantage of all technical data available and technical services offered by grinding wheel companies, manufacturers of cutting tools, and machines. We were realistic in recognizing that the correct coolant has an important bearing upon the overall performance of a cutting tool. It can and will pay dividends if we realize that all these services are available; one should take full advantage of them.

There is a reservoir of knowledge and know-how available, from company sales engineers and from technological data issued by the companies. I feel that much of this technological data has not gotten back to the users.

**Tool and cutter grinding. Center: Tools to be resharpened, tap sharpening machine. Right: Heald tool grinding machine.**

**Tool and cutter grinding department. The Ingersoll cutter grinder in the center is used for sharpening carbide inserted tooth cutters.**



**Educational approach which we have felt to be successful is the installing of a movie screen which is pulled down from the ceiling of the grinding room. This screen is located within the operating area. By this means we are able to visually show any new grinding technique or information we feel would benefit the operator. This simple introduction gives them relative thinking between the slide, the machine and the operator, making them able to visualize more readily. Person in picture is Tom Soccocio, foreman of grinding room.**

In regard to the sales or service engineers, we should realize that these men have often made a life study of a certain phase of tooling and should be considered authorities. Furthermore, what may appear a difficult tooling problem within the plant is frequently just another problem which they've handled before.

We, at Carrier, to furnish the operator with the technical data which I have referred to, have set up within our organization a display cabinet whereon we mount technical information of a nature which we feel can be used by operators. In fact, we have gone one step farther and tried to cover this field plantwise.

One other educational approach which we have found to be very successful is that of installing a simple projection screen which is pulled down from the ceiling of the grinding room. This screen is located within the operation areas. When we have any new grinding technique or any information which we feel the operators should get, it is projected on the screen by slides, thereby giving the operators an opportunity to see what to do or not to do, while on the job. I do not want to give the impression he runs the machine while he is looking at the screen, but the relationship between the slides, the machine and the operator makes them visualized more readily.

**Tool and cutter grinding department. Left: Inspection plate used for checking depth of chip breakers. Right, front: Covel cutter grinder, Cincinnati Monoset, Cincinnati cutter grinder and Norton cutter grinder. Man on left is rough grinding single point carbide tipped tools.**

# NATIONAL

**ORIGINATORS AND LARGEST PRODUCERS OF THIS NEW RESINOID TYPE WHEEL**

**NATAFLEX** the latest development in reinforced grinding wheels combines break resistance with free, fast cutting action for such operations as weld grinding, general purpose rough grinding and cutting-off on ferrous and non-ferrous metals and non-metallic materials.

Customers who have put NATAFLEX Wheels through rigorous tests have standardized on these NATIONAL Wheels. That is why you should use them on your grinding and cutting operations.

NATIONAL NATAFLEX is available in straight and depressed center wheels for portable grinders and cut-off machines, in sizes from 1" to 24" in diameters and ⅛" to ½" in thickness.

*Write today for complete*
*NATIONAL NATAFLEX information*

- **REINFORCED**
- **BREAK RESISTANT**
- **FASTER CUTTING**

**NATIONAL**
**GRINDING WHEEL CO., INC. N. TONAWANDA, N. Y.**

The economy of tooling does not end with the initial investment of machine tools but continues on just as long as production runs. The machine tools are simply the means of driving the cutting tools. Therefore, production costs can readily be seen in down-time by incorrect grinding or poor design of cutting tools. One must make available to the grinding room personnel not only information pertaining directly to its phase of the operation but relative facts such as the importance of feeds and speeds. A wealth of information is available from the manufacturers of grinding wheels. Here again, this information should not be ignored but should be channeled to your grinding room personnel. Too often such technical information and data is wasted by not getting it into the hands of those people interested in that information. The awareness of ignorance is the beginning of wisdom. This is the thinking we strive to impress upon our personnel. How frequently one hears reference to the fact that a machine tool is down because the cutting tool was not ground correctly, or because we have a poor finish on the part machined.

So that we may get the best complete all-around end results, we have made it a standard practice to see that every operator is given the opportunity of learning to run each machine tool in his department. This rotation of personnel machine-wise tends to improve the quality and efficiency of the operator, familiarizing him with the limitations and abilities of each machine tool. But at the same time it will definitely develop a man's confidence in his own abilities and will also offer a challenge to the more progressive workers.

However, some operators are able to run one machine more efficiently than another, and each man is eventually put on that machine which he handles best, thus giving us all-around efficiency. This type of training can be a life saver in cases of limited production, tardiness or sickness because trained operators and complete coverage within the department is available at all times.

First run tools are manufactured on a competitive basis, and here again, operators are given an opportunity not only to regrind tools but to create them. This widens their imagination and gives them a deep respect for the tool because they are familiar with all that goes into the making of it. This deems

**March 1 To December 1954**
**First Run and New Tools Made For Production**

| | DEPT. A QTY. | DEPT. B QTY. | |
|---|---|---|---|
| March | 853 | 86 | |
| April | 410 | 62 | |
| May | 207 | 47 | |
| June | 112 | 35 | |
| July | 35 | 21 | |
| August | 22 | 22 | |
| September | 353 | 67 | |
| October | 144 | 53 | |
| November | 92 | 50 | |
| December | 161 | 58 | |
| | 2389 | 501 | 2890 |
| Approximate Savings per Tool | $3. | $2. | |
| **TOTAL SAVINGS** | **$7167.** | **$1002.** | **$8169.** |

Department (A) uses larger size single point tools because of the heavier nature of the work. This necessitates using larger size carbide blanks.

Not included above is the savings made thru less paper work by being able to order tools right in our own plant. Also immediate delivery.

March 1 to December, 1954
**Reclamation of Single Point Tools**
**RECLAMATION OF SINGLE POINT TOOLS**
Mill, retip, grind and put in first class condition

| | Dept. A Qty. | Dept. B Qty. | Dept. C Qty. | |
|---|---|---|---|---|
| January | 328 | 605 | 318 | |
| February | 241 | 817 | 342 | |
| March | 155 | 892 | 163 | |
| April | 432 | 1086 | 139 | |
| May | 186 | 880 | 222 | |
| June | 385 | 823 | 138 | |
| July | 142 | 307 | 102 | |
| August | 7 | 223 | 70 | |
| September | 161 | 726 | 326 | |
| October | 417 | 542 | 218 | |
| November | 375 | 509 | 341 | |
| December | 314 | 711 | 179 | |
| | 3143 | 8121 | 2558 | 13,822 |
| Approximate Savings Per Tool | $3.00 | $3.50 | $4.00 | |
| **TOTAL SAVINGS** | **$9,429.00** | **$28,423.50** | **$10,232.00** | |
| **GRAND TOTAL** | | | | **$48,084.50** |

The above figure of $3 to $4 per tool is approximate inasmuch as the price varies because of the different size Carbide used on each tool.

# NEW

# BRYANT air sizing . . .

Bryant #2209-Y Automatic Internal Grinder equipped with Bryant Air Sizing for automatic size control of bores

Be sure to see Bryant at the Machine Tool Show, *Booth 1015*

## holds closer tolerances in internal grinding than any other sizing method!

This new method of sizing is designed especially for automatic production. It's extremely accurate, time-saving and economical—ideal for straight hole grinding when high-speed production, close tolerances and fine finishes are desired.

Bryant Air Sizing utilizes three principal operating components: Air Gage Panel, Bryant Impulse Timer and the Air Plug.

The Air Plug is mounted through the workhead and traverses continuously into the workpiece during the finish grinding cycle. Oscillation is timed and controlled from the wheelslide.

The Air Gage Panel measures the pressure peaks which occur at the air plug orifices each time the Air Plug enters the workpiece. These pressure peaks are multiplied to make gaging faster and more sensitive, and are then converted from pressure values into electrical impulses which operate the Bryant Impulse Timer.

The Timer continues the grinding cycle until the impulse signals stop, indicating that size has been reached. It then stops the grinding cycle and initiates the automatic loading cycle.

Bryant Air Sizing controls the size of workpieces *during the finish grinding cycle.* There is no contact between the gaging element and the workpiece. As a result, wear of the gaging element and possible scoring of the workpiece is eliminated.

Diamond sizing is used with Bryant Air Sizing to control size during the rough grind operation. *Write for descriptive literature.*

# BRYANT

# chucking grinder co.

85 CLINTON STREET, SPRINGFIELD, VERMONT

Offices: Indianapolis • Cleveland • Chicago • Detroit • Mt. Vernon, N. Y. • Philadelphia

*Internal Grinders • Boring Machines • Internal & External Thread Gages • Granite Surface Plates*

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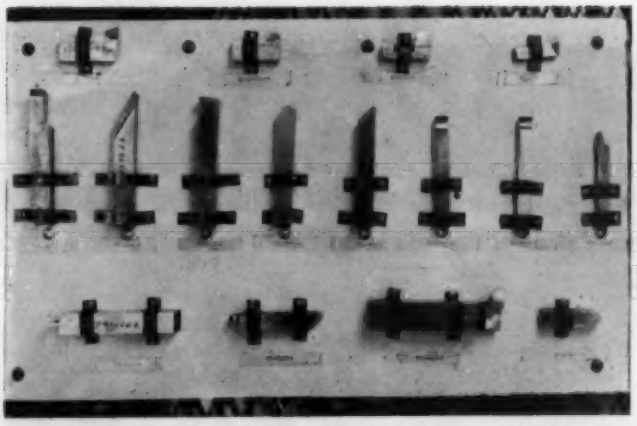


High speed steel and carbide tipped tools made for first run jobs at competition prices.

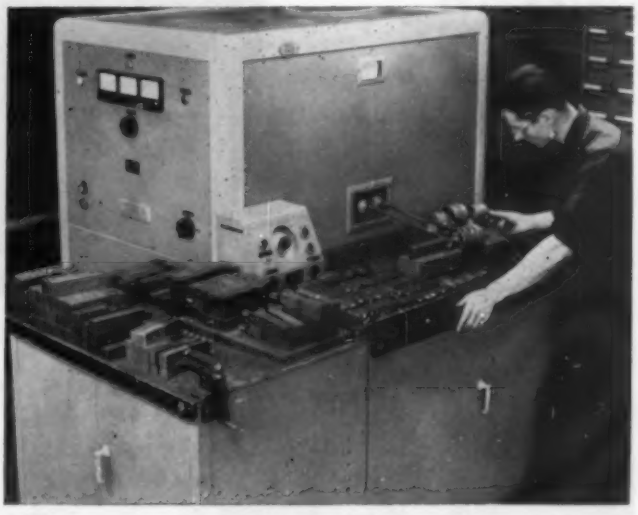
Tools ready to be milled for carbide blanks in our tool reclaiming program. Also steel ready to be milled for first run tools.

to make them cost conscious and, I feel, keeps the monotony of duplications of operations to a minimum. This applies to many modern machine tools. Not enough emphasis is placed on making each operator as self-contained in regard to all-around ability as possible. It is well if we remember: dull workmen and dull tools increase costs.

One other important element contributing to the success of our program is that we have found from experience that substantial savings can be made by taking advantage of the preformed carbide blank service which is offered by the manufacturers of cemented carbide. It is a medium of keeping the grinding time to a minimum by buying preformed blanks, particularly for special tools. The program is a real money saver since the additional charge for the preformed blank is small in comparison with grinding time and wheel cost.

In stressing these different points of major importance, I do not infer that any one of these points can put a program over by itself; rather it is all of the points combined and their proper execution that gives the final desired results.

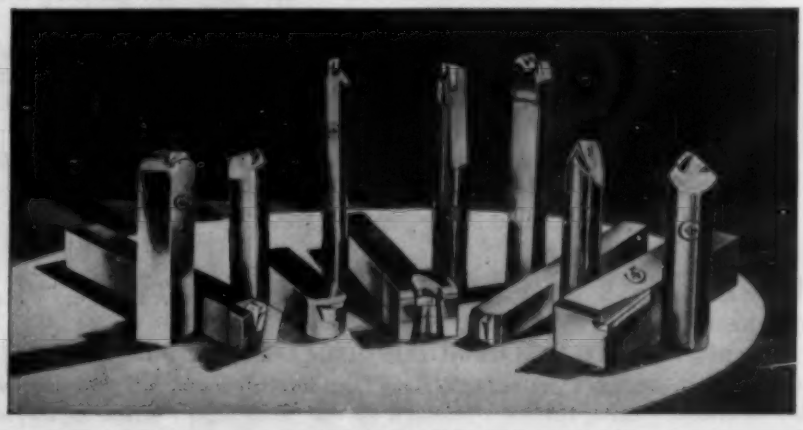
I cannot over-emphasize that a well designed cutting tool is only as good as it is sharpened. High finish to the tool means longer tool life, more pieces per grind, less machine down-time, and a better finish on the items we machine. This makes manufacturing sense and is an economy which we can-



Retipping tools with carbide by induction heating. This machine is also used for removing worn or broken tips.

not afford to ignore. There is little doubt in my mind that with further engineering advancement industry will be called upon to machine even tougher, harder and more abrasive-like metals than in the past. This constant challenge is endless.

Correct tool design, ample feed and speed, well ground tools, correct coolants, are but a few of the cost reducing ingredients which one must weave into the successful economic operation of cutter grinding. ● ●

**Diamonds for finish turning or boring plastics and non-ferrous metals. These tools are featured by quality diamonds with sharpest edges, combined with many years' experience in fitting them to perform efficiently on each operation.**

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**F. F. GILMORE & CO.**

***INDUSTRIAL DIAMONDS***

**725 BOYLSTON ST. BOSTON, MASS.**

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## Here's 62 pages of cost-and time-saving coated abrasive applications...

## ...Yours FREE for the asking!

This comprehensive manual, written by BEHR-MANNING Methods Engineers, is the first known effort of its kind in the field today. It contains detailed information which will help you solve grinding and polishing problems as well as suggest new and practical application methods.

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- Contact Wheels Influence Abrasive Belt Performance
- Tumbling and Countersinking Costs Cut by Abrasive Belt Methods
- Versatile Tool for Metal Fabricators
- Wet Belt Grinding Speeds Production of Extruded Cylindrical Stock
- Abrasive Belts Reinforced with Strapping Tape Last Longer
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- Special Abrasive Cloth Shapes Save Man-Hours
- Smooth Out Your Disc Grinding Problems
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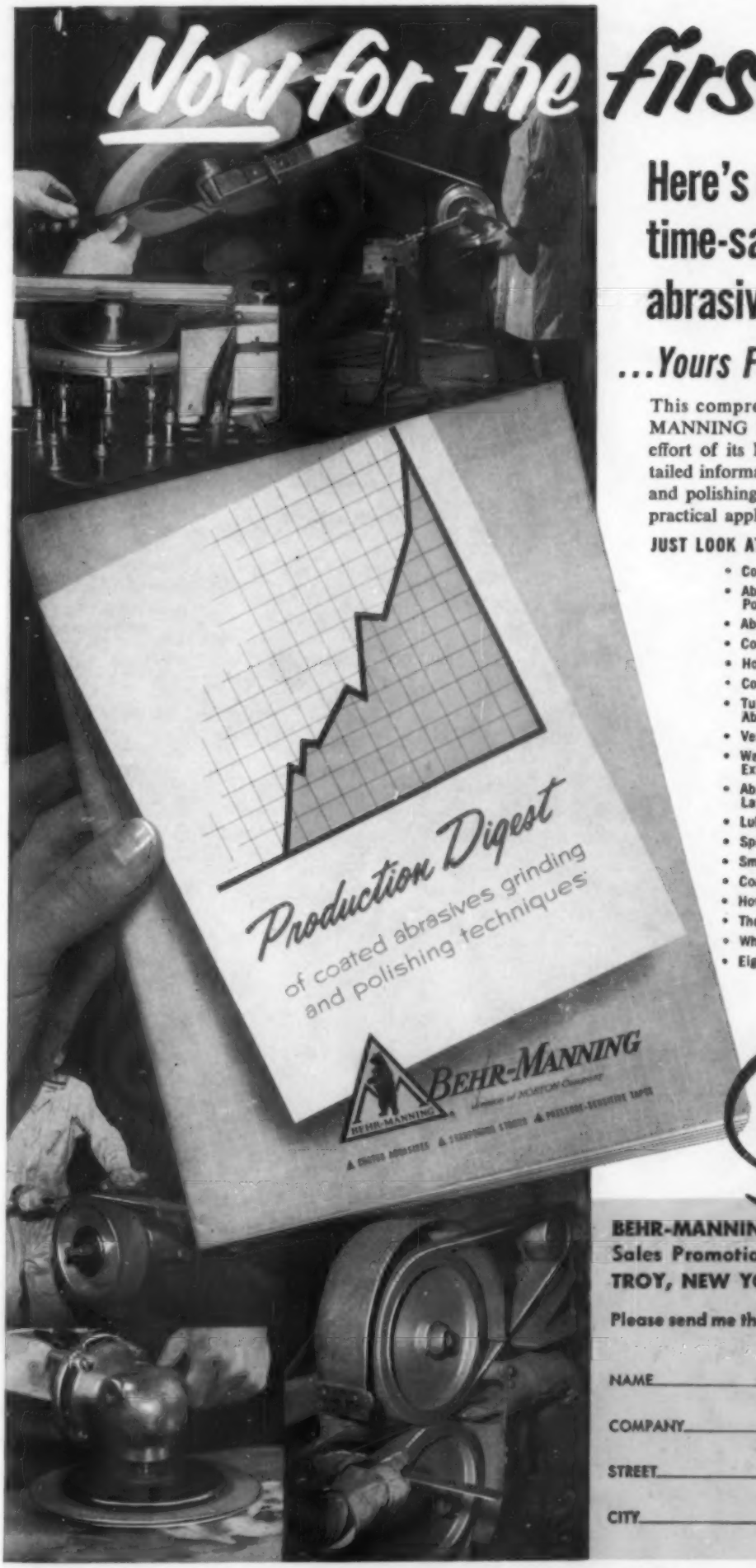


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Encircle No. A1 on card, opposite Page 68

***"Competitive wheels have never equalled G Bond wheels on our jobs."*** This Massachusetts tool manufacturer further reports he considers G Bond wheels as maximum load production wheels, besides being extremely free cutting, requiring very little dressing and giving very long life. His requirements are precision grinding hard steel to a very high finish, and to parallel tolerances of .0001". The machine is a Norton 10" Hydraulic Surface Grinder.

# Better surface grinding for you... G BOND users' reports prove it!

## *Top speed, new economy among many* "TOUCH of GOLD" *advantages listed*

Reports from surface grinding customers on the performance of G Bond wheels sound pretty much alike. That's logical, because each customer is getting exactly the advantages he's looking for — *freer, cooler, faster cutting action . . . heavier cuts without burning . . . closer tolerances and smoother finishes . . . easier dressing and more pieces per dressing . . . more work, and more kinds of work, per wheel.*

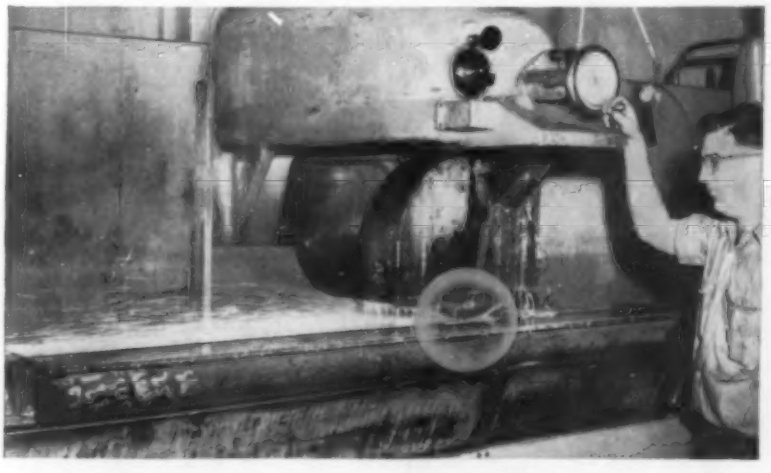
### *Your Own Surface Grinding*

will benefit by the G Bond's unique ability to hold each abrasive grain just long enough for maximum cutting action — an important "Touch of Gold" advantage that means time and money saved, plus better product quality, throughout the range of precision and semi-precision grinding jobs.

### *See Your Norton Distributor*

for the G Bond wheels, cylinders and segments you need. They're available in a variety of famous Norton abrasives. Of these, 32 ALUNDUM* abrasive is particularly suited for fast stock removal and heavy feeds — it grinds exceptionally cool and fast, with minimum dressing. And remember: only Norton offers you such long experience in both grinding wheels and grinding machines to help you produce more at lower cost. NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone directory, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

***Grinding precision spur gears of SAE 8620 steel,*** hardened to 59-63 Rockwell C, this Maryland pump and motor builder thoroughly tested G Bond wheels against other makes. He reports that G Bond wheels cut cooler, hold form much better, last 50% longer due to less frequent dressing, and are easier on diamonds.



***"Norton G Bond wheels are faster and freer cutting,*** need less dressing than any other wheels we've used," says this Pennsylvania metal working company. Material ground is boiler plate and miscellaneous steel plate. Stock removal rate is 4.5 to 6 cubic inches per minute.

***Jigs, fixtures and other parts of miscellaneous steels,*** besides some of cast iron, are the jobs on which G Bond segments are used by this Ohio tool and gage maker. He credits the G Bond segments with giving a better finish, with less dressing, than any he previously used.

W-1644

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*Making better products... to make your products better*

*and its BEHR-MANNING division*

NORTON COMPANY: Abrasives • Grinding Wheels • Grinding Machines • Refractories
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With Permanent Magnetic Chuck

# NEW *Vulcan* MOTORIZED ROTARY TABLE

## for lapping and grinding

(not an index table)

With Lapping Plate

**FASTER**
circular precision grinding!

Now with this table and with less effort you assure highest standards of accuracy, flatness, finish and close tolerances. At the same time you eliminate slow and complicated tool setups. You cut grinding time greatly by using only cross feed while the table is rotating at infinite speeds between 40 and 100 RPM.

For example, Vulcan's Rotary Table can be used in connection with a sine plate or angle fixture. The dressing of large expensive external wheels for side grinding is therefore eliminated. If you wish we can provide permanent magnetic chucks designed for use with our table, both 6″ and 10″ in diameter.

Vulcan's Rotary Table is an air operated, self contained unit, portable between bench or machine. A precision center hole for locating and tapped holes in the table for clamping provides easy setup. Circular surface grinder applications are many and varied — grind flanged studs or bushings — bearing spacers — forming rolls — cutters — convex or concave surfaces — punches or dies (radius or angle).

Lapping? Yes — and in micro inches. For the 6″ and 10″ table, lapping plates of 12″ and 16″ are provided. Perfect for lapping valve plates, gages, bearing spacers and for carbide lapping using diamond powder. *Write for circular.*

**Work clamped to motorized table, mounted on sine plate. Surface grinder application.**

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Engineering, Processing, Designing and Building . . . Special Tools . . . Dies . . . Special Machines . . . Vulcamatic Transfer Machines . . . Automation . . . including the Vulcan Hydraulics that Form, Pierce, Assemble and size. Vulcanaire Jig Grinders . . . Motorized Rotary Tables . . . Plastic Tooling.

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Encircle No. A3 on card, opposite Page 68

Pages from Ronnie Burritt's Notebook

# Producing a Flat Surface by Centerless Grinding

By **Ronnie Burritt,** Consulting Technical Editor

How often have you tried to fit two closely fitted parts together and found that the one member just couldn't be pushed down? The air which accumulated in the blind hole kept the free member popping up and down like a cork every time you pushed down.

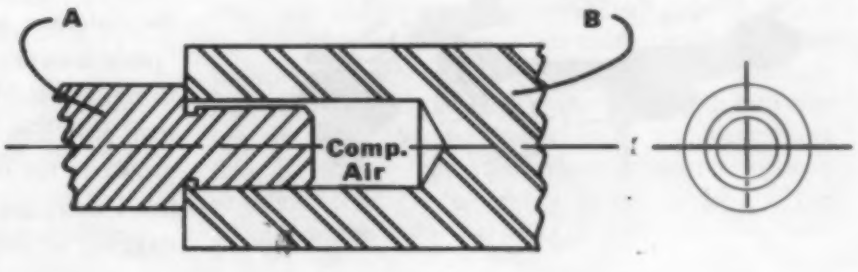
We've had that trouble time and again and tried all sorts of ideas. But nothing was satisfactory until we put the job back on the centerless and ground a flat surface along one side of the sliding member. This flat, or almost flat, portion of the circular member can be produced on a No. 2 Cincinnati centerless at a very high piece per hour rate by doing the following:

1. Shift the regulating wheel gear box into the neutral position.
2. Lock regulating wheel spindle by drawing the thrust bearing adjustment up snug. It need not necessarily be tight.
3. Set the work rest so that the axis of the part is in the same plane as the axis of the grinding wheel spindle, or slightly below.
4. Operate the machine in the same manner as any in-feed operation.

By not permitting the regulating wheel to revolve, the part will remain stationary. This is because the regulating wheel has the control over the revolving of the part. So, instead of grinding around the periphery of the part we will produce an almost flat chord along the entire length of the stem.

Since we've been doing this we've had no trouble with the compression of air in two closely fitted parts.

Incidentally, this same principle can be applied to any shaft or spindle requiring a set-screw-flat, for pulleys, sheaves, gears, etc. • •



A grinding and finishing SAFETY FEATURE

## Men Who Make Accidents Happen . . . and How to Handle Them

# Get the Stubborn Worker to Play Safe

By **Edmund Mottershead,** President
Mottershead Associates
Chicago, Ill.

**Know-it-all Sam! How do you bring him down to earth?**

● ONE of the most difficult personalities any foreman has to deal with is the guy who is always sure that he is absolutely right . . . usually on some subject about which he has no knowledge whatever. He is convinced that flying saucers are driven by men from Mars; he knows by ear just how many r.p.m.'s his engine is running; and he never has to bother backing up any statement with evidence: he KNOWS!

This is the guy who walks up to a grinder and can tell at a glance, if he bothers to look at all, that the machine is OK and ready to run. He can't be bothered to check the work rest for rigidity or position. He is too busy to inspect the wheel for cracks, wear, or check to see that it is properly mounted. He KNOWS it's all right, and anyway, he's only going to touch up his tool a bit for a couple of minutes anyway, and what could go wrong in just a minute?

Sam was once one of these stubborn, opinionated fellows who always felt that any suggestion from the foreman was an attempt by management to "push him around." Nobody could tell him anything. He might not object outright when his foreman gave him instructions, but he would frequently grouse to the other workers: "Pete's OK in his way, but I don't get this business of coming around and nagging all the time about safety. I know what I'm

OF COURSE YOU KNOW THIS, BUT PERHAPS YOU
YOU WOULDN'T PULL ANYTHING LIKE THAT, I KNOW!
YOU HAVE TO ADMIT YOU
YOU'D NEVER OVERLOOK A SIMPLE THING LIKE THIS
AND ANOTHER POINT

Sam's a little Sir Echo Now . . .

and your staunchest supporter.

doing on my job, and I don't need his advice on how to run a grinder any more than my old woman needs him to tell her how to make biscuits."

Pete, the foreman, was a bit smarter about things than Sam realized, however. He knew that once Sam opened his mouth and expressed an opinion on anything, he would fight tooth and nail to maintain that position, and it would be almost impossible to get him to change his mind. Pete figured the only way to get Sam to change his mind was to change it for him before he had it set.

Pete decided to monopolize the conversation at the outset whenever he was telling Sam anything. He knew Sam was lax in inspecting his grinding wheels or machine from time to time; so he decided to concentrate on that one subject for a couple of weeks and see what developed.

One day he started by telling Sam about the small cracks that occur in grinding wheels from time to time, invisible to the naked eye, but easily revealed by the "ring" test. Of course, he admitted that Sam knew this and would never overlook such a simple thing. Nevertheless, he went on to explain how the grade of the wheel determines the pitch given off when tapped gently with some non-metallic object. He pointed out to Sam that a good clear ringing sound indicated a wheel in good condition, and that a dead sound was a warning signal. He took Sam to the wheel storage rack and showed him how tapping a vitrified-bonded wheel produces a clear metallic ring while resinoid-bonded wheels give off a less distinct sound.

Another day he continued talking about hidden defects in wheels and regular use of the ring test. He points out to Sam that oil or water in the wheel makes the ring less clear, and that in wheels where the manufacturer has added calculated amounts of resin or grease to modify the cutting action, the ringing sound will be muffled considerably.

Pete kept up this direct method of monopolizing the conversation, and Sam, not having had much chance to say anything had no chance to stick his neck out with any opinions of his own. On the basis that other people were prone to make mistakes, and that Sam needed always to check his grinding wheels or equipment before using it, Sam got around to endorsing regular wheel inspection as a basic "must" in doing his own job.

Sam's foreman, of course, found to his surprise that Sam, after all, was a human being and had many good points in his favor. Once he had been strategically pushed into accepting an idea, he fought for it as tenaciously as he had fought for his accumulated prejudices in the past.

There are stubborn, unreasonable, opinionated workers in all kinds of shops where grinding operations are used. Very often, they are good workers who are hard to replace. However, in spite of all that the grinding wheel manufacturers do to build quality into the wheels, and in spite of all that the equipment manufacturers do to design their grinding machines to operate safely and efficiently, careless and opinionated attitudes on the part of some workers directly cause many unnecessary accidents.

Alert foremen can do the simple and constructive thing about their opinionated men: start talking before they do; keep going until you have firmly established your point of view. Keep repeating it with the tone of one who assumes that anybody with any brains at all would agree. Defend your viewpoint against imaginary attackers, enlisting the aid of the listener. Never let the stubborn soul get a word in until you've sold your whole idea. Remember: once the stubborn and opinionated individual has spoken his mind, there is no more room for other viewpoints or discussion. Give him no chance to stick his neck out until you have maneuvered him into taking the stand that you want. Once you have done that, he will be your staunchest supporter for safe grinding practices on every grinding job in the shop. ● ●

# Surface Grinding Fixture

By **H. J. Gerber**

The illustrated fixture was designed to accurately position and support a light, ribbed machine table casting for surface grinding of the top surface.

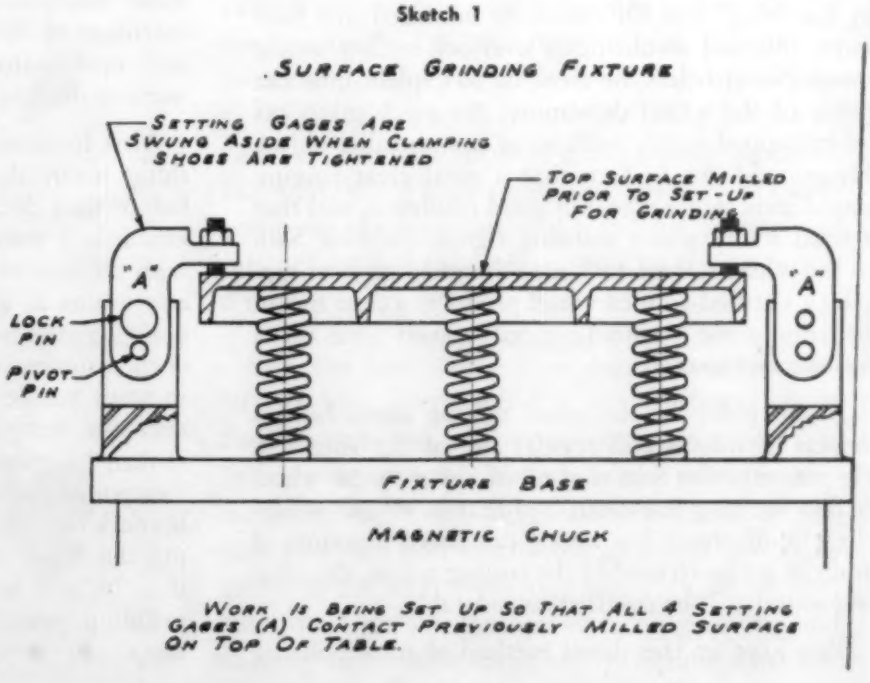
The difficulty involved in this particular job was that the top surface of these castings was rough milled prior to the surface grinding but the underside had no machined surfaces which would be suitable for seating on the grinder chuck. In order to circumvent the problem of accurately locating the milled surface parallel with the machine table it was decided to build a fixture which would make use of removable locators. It was necessary also to provide some positive means of seating and locking which would be independent of the locators. It was essential that neither the locators or the work holding clamps be allowed to impede the passage of the grinding wheel across the top surface of the casting.

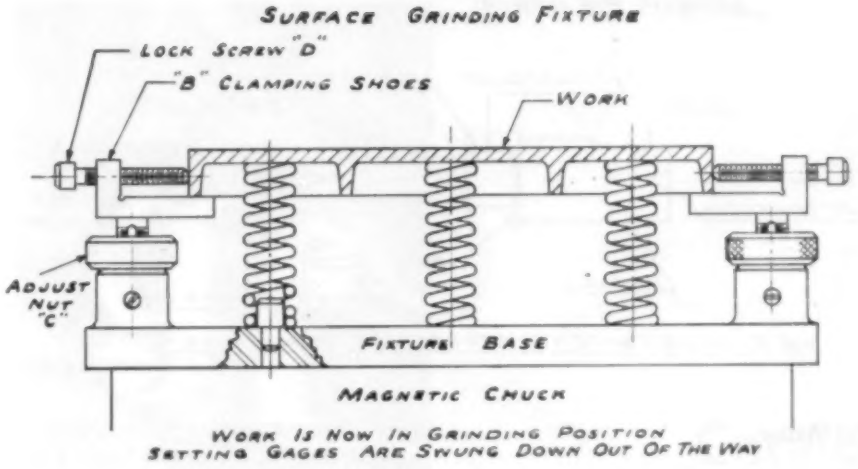
The fixture was constructed on a flat steel base plate. Upon this plate were situated a series of helical compression springs. Four pivoted, swinging locators were attached on two opposite edges of the base plate. On the other two edges four adjustable support clamps were attached.

Operation and use of the fixture is according to the following procedure:

1. The table casting, which has already had its top surface milled, is set down onto the compression springs. The casting is given a

Sketch 1

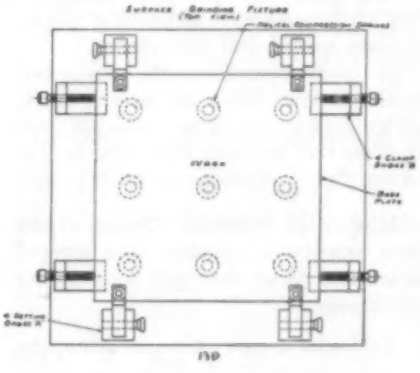

SURFACE GRINDING FIXTURE
SETTING GAGES ARE SWUNG ASIDE WHEN CLAMPING SHOES ARE TIGHTENED
TOP SURFACE MILLED PRIOR TO SET-UP FOR GRINDING
"A"
"A"
LOCK PIN
PIVOT PIN
FIXTURE BASE
MAGNETIC CHUCK
WORK IS BEING SET UP SO THAT ALL 4 SETTING GAGES (A) CONTACT PREVIOUSLY MILLED SURFACE ON TOP OF TABLE.




**Sketch 2**

slight downward pressure against the springs with one hand while the swinging setting gages **(A)** are swung upward and into contact with the milled surface, sketch No. 1, with the other hand. The lock pins are then pushed in to hold the setting gages securely. The work is now located with its milled top surface parallel to the magnetic chuck surface.

2. The clamp shoes **(B)** are next positioned upward by turning the adjusting nuts **(C)** until they are in firm contact with the casting side ribs.
3. The lock screws **(D)** are now tightened securely against the side of the casting.
4. The lock pins are now withdrawn from the setting gages and the gages are swung down out of the way.
5. Grinding proceeds. • •



**Sketch 3**

## Mist Cooling System

By **Clifford T. Bower,** Consulting Engineer

MIST COOLING of grinding wheels has been found attractive in recent years and comprises feeding drops of lubricant into the grinding wheel structure near its axis. The lubricant is forced through the porous structure of the wheel by centrifugal action and is discharged from the wheel periphery in the form of a finely divided spray, exactly where it will do the most good.

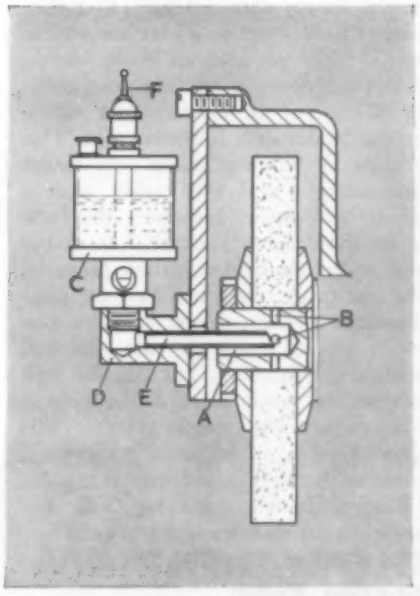
There are commercial mist cooling systems available but the one offered here has the advantage of being easily fitted to any simple surface grinder which has no wheel lubricating means provided. The author would mention that the system was conceived during the recent war when commercial coolant systems working by the spray method were almost unknown. The method is still used by several machine shops.

Modifications to the existing grinding spindle are illustrated. The spindle end is drilled with a hole **A** about ½ in. diameter and 1⅛ in. deep. Four equally spaced holes **B** of approximately ⅛ in. diameter are drilled radially through the spindle walls to intersect the spindle bore.

The lubricant reservoir **C** is made from a large drip-type sight-feed lubricator as is used on large marine engine bearings. It is mounted on the front face of the grinding wheel cover by means of a right angle adaptor **D**. The lubricator and front cover of the wheel housing can be removed as one unit for grinding wheel changing.

A tube **E** projects horizontally through the front of the wheel casing and into the spindle hole; it feeds lubricant from the container to the spindle center. Drops of lubricant drip from the tube end and are fed through the radial holes from which they penetrate into the pores of the grinding wheel. The centrifugal force divides the lubricant into a fine spray which is very efficient for cooling both work and wheel.

A ¼ pint of lubricant is sufficient




for several hours of grinding and can be renewed by inserting the spout of a pump-type oil can into the small cap on the lubricator. This cooling method has also been fitted to shop tool grinding wheels with considerable benefit. The advantage of using the large engine type of lubricator lies in the fine control over the rate of drip and the ease with which the drip can be stopped or started by moving the small lever **F** at the top. • •

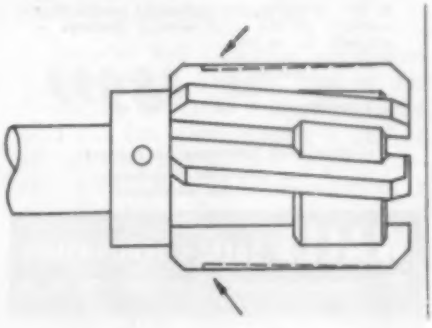
## Special Grind Improves Quality of Reamed Holes

By **John Rogers**

When reaming large holes in steel with adjustable blade reamers, it is often difficult to keep such holes within close tolerance as to diameter, taper and excentricity, especially when the length of these holes exceeds their diameters.

Adjustable blade reamers are shipped by their makers with a standard amount of back taper, at times as high as .007". When the cutting edge of such a reamer leaves the bushing and starts feeding thru a pre-drilled hole, the bushing's purpose as guide has ceased as it gives no support to the rear portion of the blades because of excessive back taper.

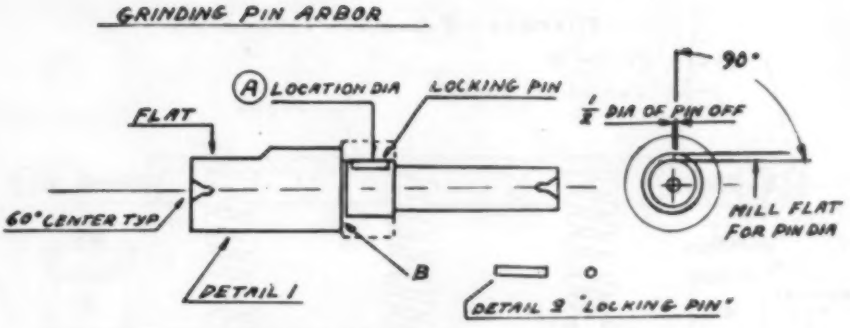
The two-step remedy for such a prob-



lem is simply obtained by: (1) reduction of back taper to a bare minimum, as f.i. .001" per inch of blade length; if this still does not result in good holes, by (2) use of the extreme rear section of the blades as a follower pilot. This is done by "circle-grinding" the blades first straight and then again with a slight back taper. However, the back taper should stop about ¼" from the rear end of the blades. If done properly, the rear quarter-inch will have the same diameter as the extreme front or cutting edge and it will not only pilot well within the bushing, but equally well within the work piece if the hole is longer than the reamer blades. The drawing shown here is an exaggerated view of the taper grind with rear pilot. (Reamer blades must be "relieved" same as on any standard grind.)

## Use a Bit of Wheel to Dress Grinding Wheels

The mechanic does not always have a diamond or steel dresser at hand for dressing a grinding wheel. In this case a piece of a broken grinding wheel performs the same service as a diamond dresser, as I have repeatedly had the opportunity to prove. Only condition consists in the fact that the piece of wheel which is utilized as dresser, should be harder than the wheel which is dressed.




## Pin Arbor

In turning and grinding, arbors always seem to present a problem. That is to say, arbors that will hold concentricity and squareness; arbors that can be quickly loaded and unloaded.

In many operations the pin arbor is the answer. With no screws, studs, or washers to put on and take off, production will increase from two to five times.

It is simple to make. It takes a part into location as quickly as a tapered arbor and locks that part securely for machining.

To locate a part on a pin arbor, the part is located on dia. "A" and banked against face "B." A simple twist of the wrist clockwise and the locating pin secures part to arbor. Held in this position excentricity cannot exceed the allowed tolerance of the bore of part to be machined. Facing ends of part on this arbor will insure dead squareness to the bore.

To remove part from arbor, the part is turned counterclockwise to release locking pin. (Note: A spot of grease in pin groove will keep pin from falling out when part is removed.)

In processing parts for pin arbor operation, the bore should be held to close tolerances for manufacturing purposes.


WALLS TU-WAY BELT SANDER

USE IT EITHER WAY

Full 1/3 h.p. G. E. Motor

At last, a top quality industrial sander that provides all the most wanted features — yet sells for so little.

complete with cord, plug, switch ready to use $89.95

Illustrated Literature on Request

A few desirable distributor territories still available.

WALLS SALES CORPORATION

333 Nassau Avenue Brooklyn 22, N. Y.

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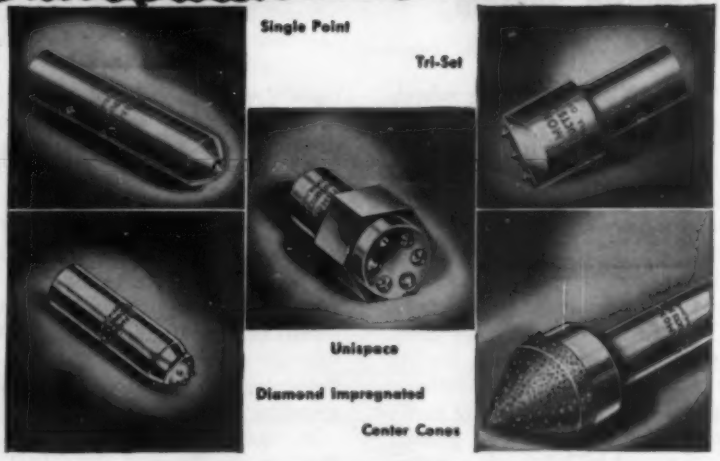
"PRESTALLOY" DIAMOND DRESSERS FOR INDUSTRY




The Diamond Products "PRESTALLOY" process assures greater diamond utility. This special mounting process offers today's lowest possible cost per dollar investment in diamond dressers.

The complete Diamond Tool Line offers these manufacturing features:

★ Advanced Diamond setting Process
★ Improved Matrix Process ★ Accurate Heat Control
★ Controlled setting pressure ★ Secure setting

SEND FOR CATALOG

Representatives in Principal Cities

DIAMOND PRODUCTS, INC.

340 Prospect Avenue, Elyria, Ohio

• Pioneering in Diamond Impregnated Products Since 1932

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Available Literature

# Catalogs and Bulletins Available from Manufacturers

**For copies of the literature in which you have an interest use the postage-paid postcard. Merely circle the identifying number and mail the postcard.**

**1. Surface Grinders.** Bench surface grinder, Model SG, capacity 4" x 8" x 6", suited for dry surface grinding dies, gages, instrument parts and other parts small enough to fit into the palm of the hand; Micro grinder, Model MG, capacity 8" x 12" x 12", which handles large work as well as small intricate jobs. Both models may be adapted to wet grinding. Illustrated bulletin available from Sandford Mfg. Corp., Dept. GF, 1026 Commerce Ave., Union, N.J.

**2. Grinding Wheel.** New Contourmatic "constant diameter" Kodiak grinding wheel for all types of grinding operations is described in a brochure published by Continental Products, Inc., Dept. 4G, 872 E. 140th St., Cleveland 10, O., distributor. Features adjustable abrasive segments, making it possible to increase or decrease diameter. Slots between segments said to improve flow of fluid or air coolant. Available in sizes to fit all standard grinding machines.

**3. Precision Grinding.** A brochure illustrating the type of precision grinding in which company specializes is available from the Johns-Hartford Tool Co., 390-FG Capitol Ave., Hartford, Conn. Work includes I.D., O.D. and surface grinding which is done on a production, short run production or experimental development basis. Company produces "Micro-keen" flat form tools.

**4. Tumbling Barrels.** Single-tumbler barrels which employ the dry process to cut down, deburr, and polish metal, plastic, hard-rubber and wood parts, are described in Bulletin LS-55 available from Tumb-L-Matic, Inc., Dept. GF, 4510 Bullard Ave., New York 70, N.Y. Recommendations for selecting specific abrasive compounds to use in various tumbling operations; detailed information on barrel sizes, drives, controls, liners and optional equipment are included in bulletin.

**5. Measuring Surface Roughness.** New illustrated catalog of Profilometer equipment for shop measurement of surface roughness is announced by Micrometrical Mfg. Co., Dept. G, 345 S. Main St., Ann Arbor, Mich. Items described include the portable Amplimeter, tracers for manual and mechanical operation, and motor-driven piloting equipment for straight-line, short-stroke and circular tracing.

**6. Abrasive Belt Grinding and Polishing Unit.** The working parts of this Vonnegut 6-60 unit consist primarily of a 1½ hp motor driving a 2½" x 60" abrasive belt and a 6" x 2½" contact wheel. It is the basic part of 3 different belt grinding and polishing machines: a swing machine; a lathe attachment; a floor stand. Complete information contained in bulletin available from Grinding & Polishing

Machinery Corp., Dept. GF, 2530 Winthrop Ave., Indianapolis 5, Ind.

**7. Centerless Grinding Fixture.** Bulletin 109, issued by S & E Machine Products, Inc., Dept. G, Bridgeport, Mich., describes their new centerless grinding fixture which is adaptable to any type of "between centers" grinding machines. Light in weight, fixture can easily be carried by hand, and all types of centerless work, such as through-feed, plunge cut or form and in-feed operations, are possible.

**8. Deburring & Finishing Equipment.** A colorful new catalog issued by ALMCO Supersheen, 919E Marshall St., Albert Lea, Minn., gives the complete story on the Supersheen line, which includes everything needed for all types of barrel finishing. Section 1, devoted to barrel speed finishing, explains what it is, how it works, who can use it. Section 2 contains photographs, specifications, etc. of the various equipment and material.

**9. Grinders, Polishers, Buffers, Speed Lathes.** Catalog No. 44, issued by the Standard Electrical Tool Co., 2478 River Rd., Cincinnati 4, O., gives full information on their complete line which includes: ¼ hp to 50 hp infinitely variable speed snagging grinders; ½ hp to 60 hp buffing and polishing machines; abrasive belt machinery; a variety of speed and chucking lathes, etc.

**10. Diamond Products.** Parsons Diamond Products, Inc., Dept. GF, 595 New Park Ave., West Hartford 10, Conn., has issued Catalog No. 2 showing their complete line of diamond tools, diamond wheels and diamond abrasives. Company's facilities also include a complete diamond tool repair service for reconing, resetting, or relapping diamond tools.

**11. Tool & Cutter Grinder.** A 15-page bulletin available from Marac Machinery Corp., Dept. G, 45 S. Broadway, Yonkers, N.Y., describes the Fritz Werner universal tool and cutter grinder No. 3.193 in complete detail. Specifications, standard and extra equipment, several pages of work examples employing this equipment, and advice on the grinding of cutting tools are included.

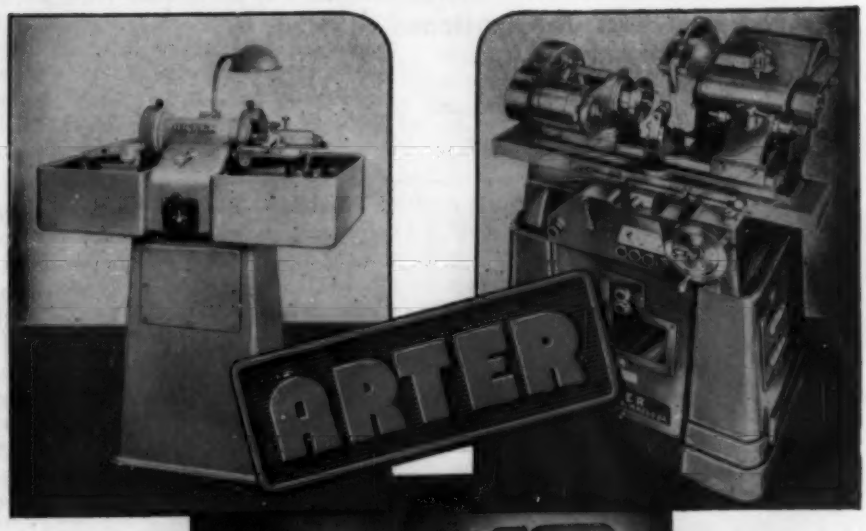
**12. Abrasive Rolls.** Information on their complete line of abrasive rolls, giving a description of their various sizes, uses, and types, is available in a new catalog issued by the American Abrasive Rolls Div., American Abrasive Products, Inc., P.O. Box 494, Dayton 1, O.

**13. Grinding, Sanding, Polishing Machines.** A new 9" heavy duty 2 hp sander and grinder, the Sand Brute—Model E, is featured in a bulletin available from the Nedco Co., Dept. GF, 88 Rumford Ave., Waltham, Mass. Used extensively in snagging operations, this model has all light alloy housings and is especially suited for welding shops, foundries, machine shops, paper mills, etc. Other grinding, sanding and polishing machines manufactured by the company are also described.

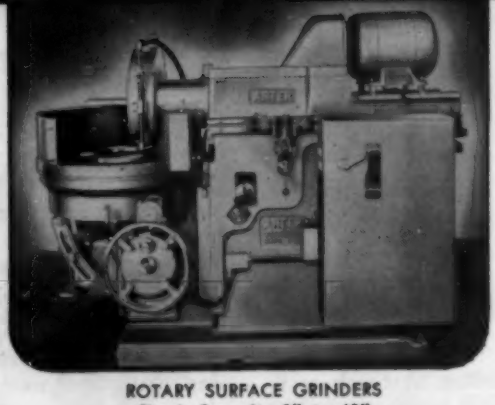
**14. Suspended Swing Frame Grinders.** Six models of 2 speed V belt driven grinders for 12" to 24" high speed wheels at 9000 to 10,000 sfpm, or vitrified wheels at 5600 to 6000 sfpm, are described in a bulletin issued by Mummert-Dixon Co., 128 Philadelphia St., Hanover, Pa. Grinding wheel is mounted on end of arbor; side of guard and grinding wheel is easily removed; instant belt release for shifting belts, belt tension adjustments are also provided.

**15. Diamond Tools.** Catalog 50, prepared by Precision Diamond Tool Co., Dept. G, Lake St., Elgin, Ill. to help industry to select the proper diamonds and tools for the job, contains information on standard single point diamond dressers with a list of grinders using the five different styles; recommendations for dressing wheels; tolerances; tool markings; multiple diamond dressers; diamond tools of special design; dressing tools for gear and thread grinders; radius dressing tools, etc.


# The Arter Family of Machines




CARBIDE TOOL GRINDERS



CYLINDRICAL GRINDERS

INTERNAL GRINDERS

ROTARY SURFACE GRINDERS
Chuck Capacity 8" to 40"

The Arter trademark on these machines is the sign of
ACCURACY • POWER • DEPENDABILITY.

Tell our engineers your grinding problems. They'll find a way to lick them

ARTER GRINDING MACHINE COMPANY
WORCESTER • MASSACHUSETTS

*Agents in Industial centers of United States and Canada*

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**16. Diamond Abrasives.** A complete range of laboratory graded diamond abrasives for every purpose, the Star Dust Line, is described in Catalog No. A-13 issued by Ace Abrasive Laboratories, 35 Roselle St., Mineola, N.Y. Diamond wheels and hones, diamond powders and diamond lapping compounds in 18 gram applicator gun or in 5 gram opthalmic tipped tube are among the items described.

**17. Radius Dresser.** The new 1955 Model "SS" radius dresser manufactured by the Somerset Tool Co., 2290 Virginia Ave., Hillside, N.J. is claimed to turn "tricky" jobs into routine operation. Easy to set, easy to see, eliminates necessity of guard removal. Folder available from company.

**18. Diamond Tools.** F. F. Gilmore & Co., Dept. GF, 725 Boylston St., Boston 16, Mass., has issued Catalog No. 45 on their complete line of diamond tools. Diamonds are set in a variety of arrangements to accommodate every need—single and multiple or cluster tools.

**19. Arnold Continuous Grinding Gages** for either mass or short run grinding are described in a catalog available from Federal Products Corp., Dept. 23D, Providence 1, R.I. Features: faster than snap gages; no stopping grinder to gage; diameter of the work is seen all the time as it grinds; various gage setups available, etc.

**20. Slitter Knife Grinder,** Model SK-24, for top or bottom slitters—wet grind—has been announced by the Hanchett Mfg. Co., Dept. GF, Big Rapids, Mich. Rigid construction, capacity 3" to 24" diameter, semi or fully automatic, positive and accurate fixturing. Complete information available from company.

**21. Free Sample.** The Hersen Chemical Co., 825-P Fisher Bldg., Detroit 2, Mich. is offering a free one-ounce sample of their new powder-additive Rance-Rid for rancid coolant. It restores the original condition of the oil emulsion. It smells, looks, and is like new. No masking odors are used. Use it in central-type coolant systems, or in individual machines. The same coolant can be treated many times. 1 ounce treats 20 gallons of soluble oil emulsion.

**22. Dresser Cutter.** The new Besly "Wise Type" 2½" dresser cutter assembly has slim "fingers" which pick abrasive grain from the surface of grinding discs instead of crushing the grain and rolling it off. This cutting action sharpens the disc without changing its grinding characteristics. Complete information available in catalog sheet issued by Besly-Welles Corp., Dept. GFM, Beloit, Wis.

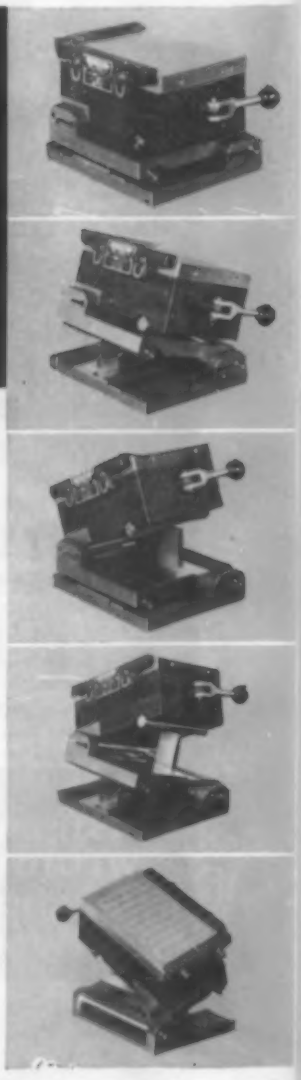
**23. Dual Action Sander** for sanding, scuffing, feather-edging, discing, polishing, and buffing. All materials, wet or dry, heavy removal or fine finishing. New sanding action that moves in two directions at the same time, turning 6000 rpm's to the right, at the same time moving in a fast reverse action to the left. Weight approximately 3 lbs. Flyer available from Detroit Surfacing Machine Co., Dept. GF, 1333 E. 8 Mile Rd., Detroit 20, Mich.

**24. Diamond Compound.** A circular available from Anton Smit & Co., Inc., Dept. GF, 333 W. 52nd St., New York 19, N.Y. gives full information on this latest addition to their line of diamond products. Scientifically prepared, it is used wherever there is a need for micro finishing and precision lapping. General recommendations, prices, etc. are included in circular.

**25. Multi-Cartridge Oil Filters.** Equipment Bulletin 201 issued by Filtration Div., Houdaille-Hershey of Indiana, Inc., 26 S. Ave., Lebanon, Ind. introduces their new line of multi-cartridge oil filters. Six different types of cartridge refills may be used interchangeably, each cartridge designed to do a specialized filtering job depending on


*Industry's most versatile Magnetic Chuck*

**MAGNA-SINE**



Here is a magnetic chuck that not only handles your parallel work but angular work, too. And angular set-ups to gauge block accuracy take but a matter of minutes!

Any angle—single or compound—is set up by inserting gauge blocks between the Magna-Sine's precision hinged base plates. Correct blocks to use are indicated in Table of Constants provided. Hours of set-up time are saved, angular accuracy is positive, work is held distortion-free on permanent magnet chuck.

**Thousands in use for grinding, inspection, drilling, boring.**
Write for free catalog which shows all styles and sizes . . . price list included.

**OMER E. Robbins COMPANY**
Dept. H-2, 24800 PLYMOUTH RD. • DETROIT 39, MICHIGAN
*Also producers of special gauges and fixtures*

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type of oil, flow rate required, kind of degree of contamination, etc. Filter is available in ten sizes using one to 24 cartridges to meet all capacity requirements.

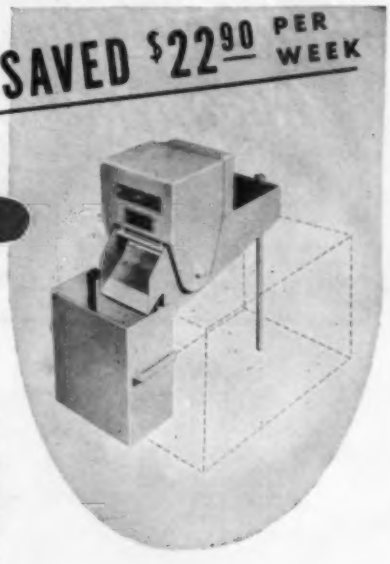
**26. Precision Spindles.** Catalog No. 20, available from the Standard Electrical Tool Co., 2486 River Rd., Cincinnati, O., features their new line of super precision spindles for grinding, boring, drilling, milling, routing and other kinds of work heads. Machine tool attachments including slides, feeds, traverse and tables, and a group of illustrations of custom built spindles are also included.

**27. Bench-type Precision Machines.** Literature on a Butterfly filing and sawing machine, which is claimed to be so smooth running that you can balance the flat end of a pencil on the table while machine is running, and a surface grinder rigid and powerful enough for deep roughing cuts, sensitive enough for fine grinding to highest accuracy, is available from Harvey Mfg. Corp., Subsidiary of Germanow-Simon Machine Co., Inc., Dept. GF, 413 St. Paul St., Rochester 3, N.Y.

**28. Magnetic Chucks.** A new multiple pole Power-Grip chuck said to have 40% more holding area is featured in Bulletin 456M issued by Sundstrand Magnetic Products Co., Div. Sundstrand Machine Tool Co., 1020-9th St., Rockford, Ill. Information on other Power-Grip chucks is also included in the bulletin.


How One Manufacturer SAVED $22.90 PER WEEK

WITH A SUNDSTRAND MAGNETIC COOLANT SEPARATOR



Cleaning the coolant tank and replacing coolant can be costly. But when done right, savings can be accumulated. In this case the coolant tank had been cleaned twice *daily*. It is now cleaned twice *weekly* with a savings per week of $22.90. Cost of the Sundstrand installation is approximately $495.00. The unit requires no attention and little or no maintenance. Why not pick up dollars like this?

EASILY INSTALLED WITHOUT ADDITIONAL PIPING

An important feature of this magnetic coolant separator is that it can be dropped into position on most open type coolant tanks. No additional piping is required. Install one on your present equipment and compare its efficient operation with other units.

FREE ADDITIONAL DATA

This folder will give you the complete facts on the Sundstrand Magnetic Coolant Separator. Write for your copy today. Ask for bulletin 457M.

SUNDSTRAND POWER-GRIP

SUNDSTRAND
Magnetic Products Co.
Division of Sundstrand Machine Tool Co.
1020-9th ST. • ROCKFORD, ILLINOIS

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**29. Honing Machines** for internal bores up to 36 in. diameter in 30 feet long cylinders are described in a bulletin on honing available from C. Allen Fulmer Co., 1246 First National Bank Bldg., Cincinnati 2, O. In one continuous operation irregularities of internal bores are cut away and the bores finished perfectly.

**30. Tumbling Abrasive.** Form ESA-236 on Borolon tumbling abrasive describes aluminum oxide lumps and grain for barrel finishing a wide variety of parts and materials. Recommended for deburring, putting a radius on small parts and precision finishing. Can be used in all types of tumbling barrels. Bulletin available from Simonds Abrasive Co., Dept. GF, Tacony & Fraley Sts., Philadelphia 37, Pa.

**31. Sandblast Machines.** Bulletin No. 1555 describes the complete line of Leiman sandblast machines, including standard cabinet type, upshot type, portable tank type, automatic type with rotating basket inside cabinet, portable blast nozzle type for large pieces, bench type cabinet model for laboratory and small shop use and a compact motor driven air compressor for plants having no air supply. Leiman Bros., Inc., Dept. GF, 102 Christie St., Newark 5, N.Y.

**32. Thread Grinders.** Automatic work cycle, automatic wheel feed and automatic wheel trueing are among the many features of Models TG-6 x 36 and TG-12 x 45 described in Catalog No. 600 issued by Jones & Lamson Machine Co., 522 Clinton St., Springfield, Vt. The 12″ x 45″ machine is used for grinding threads on a wide range of work from small to large heavy parts such as large worms, spindles, airplane engine cylinder barrels, crankshafts, etc. The 6″ x 36″ machine is used on long or short run jobs on taps, studs, gages, spindles, etc.

**33. "Eight Steps to Lower Cleaning Costs."** Bulletin No. 864 on the various applications of abrasive blast cleaning to problems encountered both in the steel milling industries and in industries concerned with the processing of steel mill products has been published by American Wheelabrator & Equipment Corp., 1172 S. Byrkit St., Mishawaka, Ind.

**34. "The Art and Science of Grinding."** The winner's answers to 36 questions submitted to the staff of Sterling grinding engineers have been compiled in a 42-page booklet issued by the Sterling Abrasives Div., Dept. GF, The Cleveland Quarries Co., Tiffin, O. The subject: What do you know about grinding

wheels? Other pertinent information on their various types of wheels, grades, abrasive grains, and on testing, correct operating speeds, hoods and flanges, etc. is also included in the booklet.

**35. Portable Air Turbine Grinder.** Permanently sealed bearings—never needs lubrication in air line or grinder, removable nose piece for deep grinding, 1/5 hp—75,000 rpm, are some of the features of the haskAIR grinder described in a flyer available from R. G. Haskins Co., 2649 W. Harrison St., Chicago 12, Ill. Complete kit includes grinder, carrying case, adapter hose, mounted points, dressing stone and wrenches.

**36. Depressed Center Wheels.** Literature on the new NR Amerflex depressed center wheels, which are designed with nylon reinforcing for strength and safety, is available from American Emery Wheel Works, Red Bridge, Providence 1, R. I. Safety proven tests, recommended speeds, etc. are included.

**37. Dust Collectors.** 37 standard models of Dustkop dust collectors, 300 cfm to 10,000 cfm, ready to use and available from stock, are described in literature available from Aget Mfg. Co., 1408 E. Church St., Adrian, Mich. For surface grinders, tool and cutter grinders, polishers and buffers, abrasive belts and discs, etc. Information on their complete line of mist collectors is also available.

**38. Production Digest Manual.** Written by Behr-Manning methods engineers, this 62-page manual of coated abrasives grinding and polishing techniques contains detailed information which will help solve grinding and polishing problems as well as suggest new and practical application methods. The Digest comprises 18 illustrated articles on coated abrasives which have appeared in leading trade journals, and is available from Behr-Manning Corp., Dept. GF, Troy, N. Y.

**39. Magnetic Chucks.** A catalog, issued by Omer E. Robbins Co., Dept. H-2, 24800 Plymouth Rd., Detroit 39, Mich., gives complete details on the Magna-Sine magnetic chuck which handles parallel and also angular work. Any angle, single or compound, is set up by inserting gage blocks between the Magna-Sine's precision hinged base plates. Correct blocks to use are indicated in Table of Constants provided.

**40. Honing.** Sunnen Products Co., 7923 Manchester Ave., St. Louis 17, Mo. has issued six booklets to help solve production problems on bores and shafts: No. 50 on honing machines; No. 51 on portable cylinder hones; No. 55 on tool room honing; No. 505 on honing supplies and accessories; No. 58 on external hones and No. 60 on 105 honing case histories.

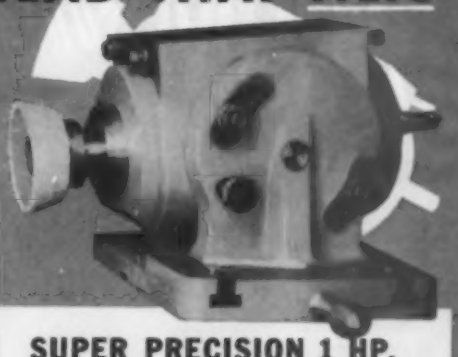
**41. Flexible Shaft Machine Catalog.** Franklin Balmar Corp., N.A. Strand Div., Dept. G, 5200 Clipper Rd., Woodberry, Baltimore 11, Md., has issued a new catalog covering complete line of Strand flexible shaft machines and accessories. It presents three basic types of machines; single speed direct drive, multiple speed countershaft drive, and multiple speed gear-drive Strandflex drive. Also useful tables relating to grinding wheels and operating speeds are included.

**42. Precision Face Grinders.** A 20-page bulletin illustrating and describing a new concept in precision face grinders is available from the Besly-Welles Corp., 128 Dearborn Ave., Beloit, Wis. Diagrams and performance data show how this type of grinder increases production by using two work stations and automatically indexing the grinding head over each of them on alternate grinding cycles.

**43. Ultrasonic Cleaning Equipment.** Model DR-400, for production cleaning and degreasing of precision products, electroplating, soldering aluminum, degassing molten aluminum, metal cutting and many other applications in metalworking machinery, welding, and foundry shops is described in Bulletin DR-400 available from Acoustica Associates, Inc., Dept. GF, Shore Rd., Glenwood Landing, L. I., N. Y.


HERE'S A HEAD THAT TILTS

*and Yours Will Nod, Too When You See What You Can Do With This One*

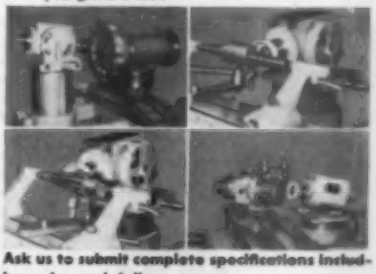


POPE SUPER PRECISION 1 HP, 3600 RPM MOTORIZED TOOL AND CUTTER GRINDER CLEARANCE ANGLE SWIVELLING HEAD

With Angular Adjustment In A Vertical Plane

**Give this versatile head the nod and save time and money these seven ways:**

1. You can use cup wheels for practically all clearance angles and thus produce a cutting edge on tools that lasts longer because it is stronger.
2. You can keep the tooth rest on the center line of the cutter for practically all grinding on centers or in the work head.
3. You can grind most cutters and reamers all over with a single set-up using the swivelling table and Pope tilting head.
4. You can read all clearance angles directly in degrees from the scale provided on the head. No more mistakes.
5. You can get the right clearance angle on such tough grinding jobs as slab mills, taper reamers, angular cutters and form tools.
6. You have one safe speed — 3600 RPM — for all wheels generally used on cutter grinders. Heat checking of cutters is virtually eliminated.
7. You have a head that's so easy to adjust and use it saves you time and money every time you grind a tool.



Ask us to submit complete specifications including price and delivery.

No. 101

Specify POPE PRECISION SPINDLES

POPE MACHINERY CORPORATION

Established 1920

261 RIVER STREET • HAVERHILL, MASSACHUSETTS

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**44. Cylindrical Grinding Attachment.** Cylindex, Inc., Dept. G, 44 Charlotte St., Binghamton, N.Y., has issued a new catalog presenting the new Model "C" Cylindex. Catalog describes improvements and new features, such as heavier motor, new adaptor plate to grind up to 45 degree tapers, method of grinding milling cutters and other tools, and the addition of hardened ground steel ways.

**45. Portable Power Tools** are described and illustrated in Catalog No. 5410 from Syntron Co., Dept. GF, Homer City, Pa. Tools include electric hammers, hammer drills, electric saws, electric drills and screwdrivers, grinders and sanders, concrete vibrators, gas hammer paving breakers and rock drills.

**46. Hydraulic Grinding Fixture** for centerless grinders, made by Modern Devices, Dept. GF, Box 429, Libertyville, Ill., is automatically operated, magnetically held, and eliminates several operations. Folder illustrates and includes applications.

**47. "Abrasive Grain and Powders,"** is a booklet for use in metal finishing issued by The Carborundum Co., Dept. GF, Niagara Falls, N.Y. The booklet contains charts and illustrations and many of Carborundum's engineering recommendations. Topics include "Properties of abrasive grain and powders," and "Elements of metal polishing." Also contains a suggested layout for set-up room and curing room and provides data on metal buffing, metal tumbling and pressure blasting.

**48. Wheels.** Catalog No. 1, issued by Red Hill Grinding Wheel Corp., Dept. GF, Pennsburg, Pa., gives complete information on their line of resinoid grinding wheels: straight wheels; cup wheels; cones, blind ends and pot balls; special shapes. A pictorial trip through the plant, showing the Red Hill methods and equipment, is also included in catalog.

**49. Plain Cylindrical Grinder.** A new 16-page catalog describing the Landis Tool 4" Plain Cylindrical Grinder for precision cylindrical grinding operations is available from Landis Tool Co., Dept. GF, Waynesboro, Pa. This hydraulically operated grinder will handle small parts on a high production basis. Catalog is illustrated with 37 pictures and sketches.

**50. Microhoning Tools.** Micromatic Hone Corp., Dept. G, 8100 Schoolcraft Ave., Detroit 38, Mich., has issued a new catalog covering microhoning advantages and formula, cylindrical microhoning equipment, finishing flat surfaces, tools, fixtures, abrasives and services.

**51. Dry Centrifugal Dust Collector.** American Air Filter Co., Inc., Dept. GF, Louisville 8, Ky., has published Bulletin No. 291 which introduces a new principle in dry centrifugal dust separation. It is designed to handle large exhaust volumes of granular dust. Bulletin is illustrated and includes diagrams, table technical data.

**52. Refinishing of Stainless Steel.** Manual available from R. G. Haskins Co., 2647 W. Harrison St., Chicago 12, Ill., covers methods of refinishing stainless steel, mill finishes, sheet finishes, grinding, polishing, buffing and tips for better finishing. Also includes specifications and illustrations of Haskins flexible shaft machines and accessories.

**53. Coolant, Circulating and Agitating Pumps.** Designed for easy reading, a new catalog issued by the Graymills Corp., Dept. GF, 3705 N. Lincoln Ave., Chicago 13, Ill., contains dimensions, performance data, etc. on their complete line of Superflo pumps. Any of the pumps described in the catalog can be combined with tanks and accessory equipment. Standard tanks ranging in size from 2 gal. to 38 gal. capacity are available. Special designs can be constructed.

**54. Coolant Systems.** A bulletin issued by the Aetna Mfg. Co., Dept. GF, Bensenville, Ill., describes Mistic Mist coolant systems for sawing, milling, drilling and grinding. Application photographs and results of tests on various applications using Mistic Mist are included in bulletin.

BLOHM
HORIZONTAL
SURFACE GRINDERS*
You'll be Amazed...
at the high quality job you can do with BLOHM's new line of horizontal surface grinders . . . and even more amazed at the extremely low cost!
Cross movement by the table assures maximum precision and accuracy Powerful heavy-duty 5 hp motor mounted directly on spindle operating on adjustable oilmatic bushings – pressure lubrication – Use wheels up to 4" with cross feed up to 2½" per stroke These features, plus the unusually sturdy overall construction, eliminate virtually all vibration and insure maximum concentricity Exclusive BLOHM MICROTIP in-feed and depth-feed control permits automatic fingertip adjustment up to .0002" on cross feed and .00004" in depth feed
* See this unusual machine in operation at Booth 642 in the Chicago Coliseum, September 6-17
MASERATI
Write, Wire or Phone for detailed descriptive literature
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## Houdaille-Hershey Corp. Buys Plants from Buffalo Firm

The Houdaille-Hershey Corp. of Detroit has acquired a group of diversified plants owned by Frontier Industries, Inc., of Buffalo, N.Y. Stockholders of both companies approved the purchase, said Ralph F. Peo, president of Houdaille-Hershey.

The combined operations have been charted into four groups under a new management structure. Heading these groups is Gerald C. Saltarelli, who has been elected vice-president in charge of operations. Saltarelli previously has been vice-president and general manager of Houdaille's automotive division.

Group heads are: Herbert H. Roosa of Buffalo, for the past six years a Frontier vice-president in charge of Frontier's Manzel division, who now has been elected vice-president in charge of subsidiaries; F. A. Smith, manager of Houdaille's Huntington, W. Va., plant, who has been elected vice-president in charge of the automotive group; E. Glenn Gorman of Buffalo, who has been promoted from his position as manager of Houdaille's aircraft division to head the company's aviation plants and products, and Frederick J. Schmidt, president of Frontier's Buffalo Crushed Stone Corp., who will be in charge of the stone products division.

Re-alignment of executive personnel will bring Granger B. Thurstone from his management of Frontier's Fairmount Tool & Forging, Inc., Cleveland plant to Buffalo to become plant manager of Manzel, producer of lubricating machinery for the machine tool, diesel engine, air compressor and chemical industries.

Succeeding Thurstone at Fairmount is E. L. Spencer, who since last August has been Fairmount's sales manager. Joining the organization as vice-president of the Buffalo Crushed Stone Corp. is Col. Harry H. Haas, who has just resigned from active army service in Washington, where he has been in charge of procurement and production in the office of the Assistant Secretary of Defense for National Security Affairs. As part owner of the Nustone Products Corporation of Tenafly, N.J., Col. Haas was engaged in the manufacture of concrete products for more than 18 years. A new engineering laboratory in Pasadena, Calif., is under the management of Robert D. Fagely, Houdaille manufacturing engineer. Clarence S. Sorensen, aviation engineer, has been appointed consulting engineer.

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## Norton Elects Officers

Norton Company stockholders and directors named five new officers and one director at the 70th annual meeting recently. Two retirements—one a director, the other an officer—were also announced.

**Edwin E. McConnell** of Worcester was elected treasurer, succeeding **William J. Magee,** also of Worcester, who has retired. Mr. McConnell was controller from 1941 and a director since 1951.

**William H. Perks** was appointed controller to succeed Mr. McConnell and also elected a director, replacing Mr. Magee on the board.

**Robert D. Lawson** was elected to the new position of vice-president and sales manager of the company's Grinding Machine Division.

**Richard Prouty** became secretary, succeeding **Malcolm Pilsworth,** who has retired.

**Fairman C. Cowan** was elected clerk of the corporation, succeeding Mr. Pilsworth. He was also appointed assistant secretary and general counsel.

**George Jeppson** was re-elected chairman of the board and **Milton P. Higgins** re-elected president by the directors.

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# Mobile Workshop has 10,000th Visitor

The 10,000th visitor was recently welcomed aboard the Carborundum Company's mobile abrasive workshop. He is Raymond Miska, master mechanic of Webster Electric Co., Racine, Wis.

The workshop, conceived about two years ago, has traveled over 24,000 miles, visiting 44 states and presenting over 1100 abrasive demonstrations. Carborundum has installed eight late model coated abrasive machines and numerous portable grinding and polishing tools in the self-contained mobile unit.

To provide adequate floor space for viewing demonstrations, the side wall of the vehicle is expanded during stops to increase the floor width to 15 feet. It will accommodate 10 to 20 visitors at each demonstration. Two five-ton air conditioners and a dust disposal unit are used in conjunction with the grinding machines.

After 22 months on the road, the workshop recently headed back to Niagara Falls. Some of its equipment is being replaced with the newest machines and abrasive belts.

**Raymond Miska, master mechanic, Webster Electric Co., Racine, Wis., was the 10,000th visitor aboard the Carborundum abrasive workshop. Participating in a recognition ceremony were: Front row—Robert Jessen, Webster Electric; E. Schineebile, J. I. Case; P. Gregg, Walkers; O. Quist and G. O. Watson, Carborundum, who presented Miska with an electric mixer in recognition of his lucky number. R. Miska; A. Stoffel and W. Gray, Machine and Factory Equipment, sponsor of the Workshop in Racine who presented Miska with a Thor drill; F. Garske, Jr., Carborundum. Second row—Ted Zunke, Andis Clipper; F. X. Pfister, Walker Manufacturing; F. Stendle, Webster Electric; C. Merriel, J. I. Case; R. Soens, Webster Electric. Third row—J. Spiker and M. Andis, Andis Clipper; M. Erickson, Carborundum; Al Simons, J. I. Case; R. Ellis and J. Bishop, both of Carborundum.**

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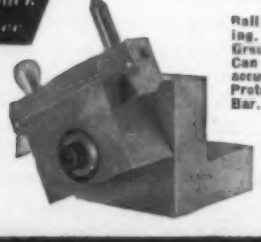

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**H. J. Miller, (right) president of Speed-D-Burr Corp., Los Angeles, Calif. has announced the appointment of William T. Elmas (left) as sales and technical engineer in the Los Angeles territory. Elmas recently moved west from New Haven, Conn. He has an extensive engineering background in the finishing field.**

### Speed-D-Burr Now Separate Corporation

The Speed-D-Burr Division of Miller Machine Tool and Gauge Co., Glendale, Calif., is now known as Speed-D-Burr Corporation.

This completely separate organization is devoted exclusively to the engineering, sale and service of the Futurama and Mity-Mite lines of precision barrel finishing equipment and the companion lines of media and compounds and handling equipment. Barrel finishing job shop work will also be handled by the new corporation, which is located at 3613 San Fernando Road, Glendale 4. Job machining work will still be performed by Miller Machine Tool and Gauge Co. of the same address.

### Norton Co. Appoints C. H. Quick

C. Herbert Quick has been appointed assistant to the director of research and development of Norton Co.

Quick first came to Norton Company in 1924 and was employed in the research laboratory. He was assistant superintendent Plant 2, chief inspector and engineer of ceramic development before being appointed to his present position. Prior to coming to Norton he was with the U. S. Gypsum Co. in Chicago.

### Name Change

James L. Erickson, chairman of the board of American Abrasive Rolls, Inc., has announced that the corporation has changed its name to American Abrasive Products, Inc.

Two separate divisions will be operated by the company: The American Abrasive Rolls division and the AC Abrasive Rolls division. Both will be located in the company's plant in Lewisburg, Ohio, with the executive and sales offices in Dayton, Ohio.

Robert P. Rush is now the Chicago territory representative of the American Abrasive Rolls division.

**Wilbur E. Kidder, safety manager of Behr-Manning, right, holding plaque, shows Elmer G. Schacht, president, the Award of Honor which Behr-Manning received from the National Safety Council. Members of the Behr-Manning safety committee looking on are, l to r: Harry R. Meyer, Anthony S. Susko, Maynard F. Witherell, Irving W. Lobdell, James F. Corr, Louis J. Struzenski, Patrick J. Mastan, Charles W. Teale, Norman F. Coons, Joseph L. Biehl, Philip Hall, Joseph J. Butsch and G. Ernest Boehme.**

## Behr-Manning Captures National Safety Award

Receipt of the National Safety Council's Award of Honor for 1954 has been announced at Troy, N.Y., by Behr-Manning division of Norton Co.

To earn it, nearly 2000 employees worked nearly 4,000,000 man-hours with only 12 lost-time or disabling injuries—equivalent to a man's working 165 years per injury. Behr-Manning attained a frequency of injury 69 per cent better, and a severity rate 90 per cent better, than the average for its industry.

Commenting on the award, Safety Manager Wilbur E. Kidder said, "This was a group effort of which every man and woman at Behr-Manning may be proud. For the three previous years we won the Award of Merit, second highest given by the National Safety Council, but this year we hit the top as the result of a safety program that had the support and participation of every individual in our company."

**Oliver A. Gottschalk**

**George J. Zimmerman**

### Carborundum Names New Treasurer

**Oliver A. Gottschalk,** formerly assistant to the president of The Carborundum Co., has been elected treasurer-controller of the company.

**George J. Zimmerman,** staff assistant for management controls, was named assistant to the president.

In his new post, Mr. Gottschalk assumes treasurer-controller duties for The Carborundum Co.; The Canadian Carborundum Co. Ltd.; The Carborundum Metals Co., Inc.; Canada Sand Papers, Ltd.; R. C. Bowers Co.; Curtis Machine Corp.; and Carborundum Co. of Puerto Rico.

Mr. Zimmerman will assist the president in the general management of the business, and conduct special investigations and studies.

What's New in Equipment and Materials

# All Coated Abrasive Wearable Wheel

**New development puts high finish on metals, conforms to complex contours throughout weeks of wear in automatic production set-ups.**

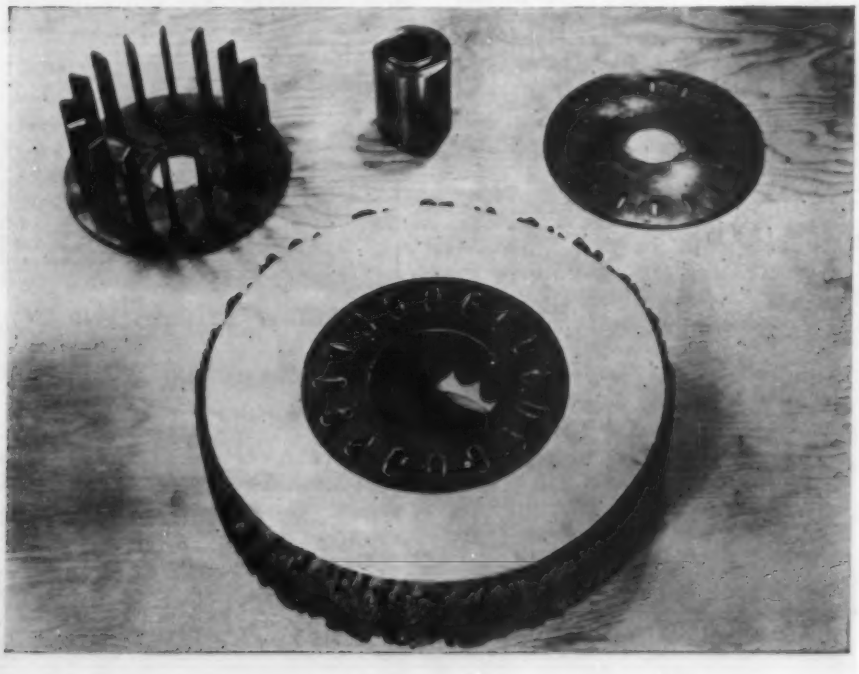
A BASIC improvement in automatic metal polishing which promises a reduction in polishing costs is announced by the Behr-Manning Division of Norton Company, Troy, N.Y.

The basic improvement is an all-coated abrasive wheel capable of being shaped to the work and holding that shape as it wears. Designed for use on straight-line and rotary automatic polishing equipment, it is equally adaptable to semi-automatic fixtures where it requires no special attachments or other accessory equipment.

Significant benefits claimed for the new "Kon-Toor" wheel: development of fine finish on involved contours; maintenance of original contour through the working life of the wheel; elimination of one or more buffing stations; reduction in cost as a result of wheel's long life.

In the plant of a midwestern appliance manufacturer which has been co-operating in a year long test program, for example, 180-grit Kon-Toor wheels 7 in. wide have each worn three to four weeks and applied a first

**A standard Kon-Toor refill wheel (available in widths to fit two-, four-, six- and seven-inch cages) with the simple parts which fit it for mounting on a drive spindle. Clockwise, these include the cage with its 16 elliptical tubes which engage the folded packets of coated abrasives; the correct size of bushing to fit the drive spindle; and the side plate. In use, the assembly is held in place by the conventional washer and nut. The canvas side shield reduces wind and noise.**



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This operation, polishing an aluminum stamping for restaurant kitchen use, is typical of the straight-line and rotary automatic polishing equipment for which the wheel was developed. Here a wheel, two inches wide, has been shaped to polish the rounded edges of this part.

A second shaped wheel fits the multiple concave and convex contours of the rolled and pressed edge. As it wears down from its original 17-inch diameter through many days of use, the polishing surface of this wheel will retain its fitted shape without further dressing or other attention.

intermediate polish to as many as 350,000 contoured toaster sides. Compared with abrasive belts previously used, production increased 15 per cent and abrasives cost dropped nearly 50 per cent.

This manufacturer also found, as a by-product of the smooth wiping action and light pressure exerted by the new wheel, that his work was running cooler than before, so that heat distortion was eliminated. Also, the wheel consumed less power, a fact which may become important as new straight-line, rotary or semi-automatic polishing departments are installed.

Construction is unique but simple. The hub is a rugged steel cage whose side flanges are joined by 16 rods, each supporting an elliptical tube. These tubes hold U-shaped packets of folded, coated abrasive sheets with grain on both sides. Bushings are provided to fit standard drive spindles. Canvas side shields, which reduce wind and noise generated by the relatively open construction, complete the assembly.

Wheels are 17 in. in diameter, and from 2 to 7 in. in width. For greater widths, wheels may be ganged. Performance is maintained unimpaired throughout the life of the wheel, and replacement wheels are available for ready mounting on the original cage or hub. Abrasive cloth used is silicon carbide or aluminum oxide in a grit range of from 120 to 400. Recommended wheel speeds range between 1500 and 2400 rpm.

Designed for standard spindle mounting, the new wheel can replace a set-up wheel, wire brush compound wheel or buffing wheel instantly—without

Here, two 180-grit wheels are production-polishing metal parts. Note that these pieces are turned 90 degrees between wheels in order to cross grit lines. Both wheels were originally 17 inches in diameter; that on the left has been in use four weeks, but still retains the shape which was applied to it for this specific project.

Shaping the wheel is a simple process. Here, the contour of a stainless steel sauce pan is being fitted accurately to a profile gage.

Next, a wood block is shaped to match the profile as transferred from the sauce pan. A piece of coarse sandpaper is then fastened to the wood block.

With the wheel rotating, the sandpaper-covered forming block is pressed against it until its polishing face is shaped.

The wheel is now mounted on its polishing head and the sauce pan being polished is rotated on a fixture against the wheel. Observe the large area being polished.

**These bumper guards, placed on work-holding fixtures of a straight-line horizontal unit, are carried past the face of a six-inch wheel rotating at right angles to the direction of travel of the piece.**

**Sheets of coated abrasive, with grain on both sides, are folded into packets. Sixteen of these packets form the Kon-Toor wheel.**

change of safety guards, backstands or motor speeds.

Simple, slight contours may be polished with the wheel as delivered. To polish sharp angles or complex contours, the face of the wheel is dressed to the contour. Where the contour must be precise, a profile gage is used to transfer the contour of the work piece to a wooden block; the block, faced with coarse sandpaper, is then used to dress the wheel accurately.

The new wheel is fundamentally a polishing tool; as in the past, removal of weld marks and other major imperfections should be done by other methods. • •

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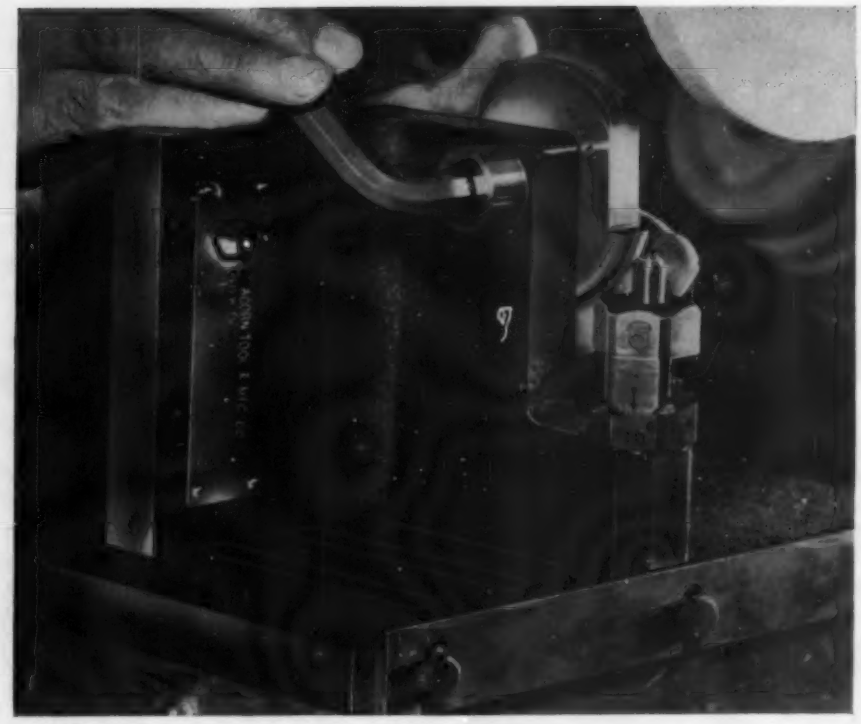

## Circular Form Tool Grinding Fixture

This new Acorn grinding fixture requires no calculations to operate. Simple settings are all that is needed to resharpen circular cutting tools. Proper relationship between cutting face and centerline of tool, as well as same degree of hook, are maintained at all times, it is claimed.

The fixture adapts to any make of surface grinding machine, with or without magnetic chucks. It can be used to grind with the periphery or the side of the grinding wheel. Pabco Industries, Inc., 6943 West Grand Ave., Chicago 35, Ill.

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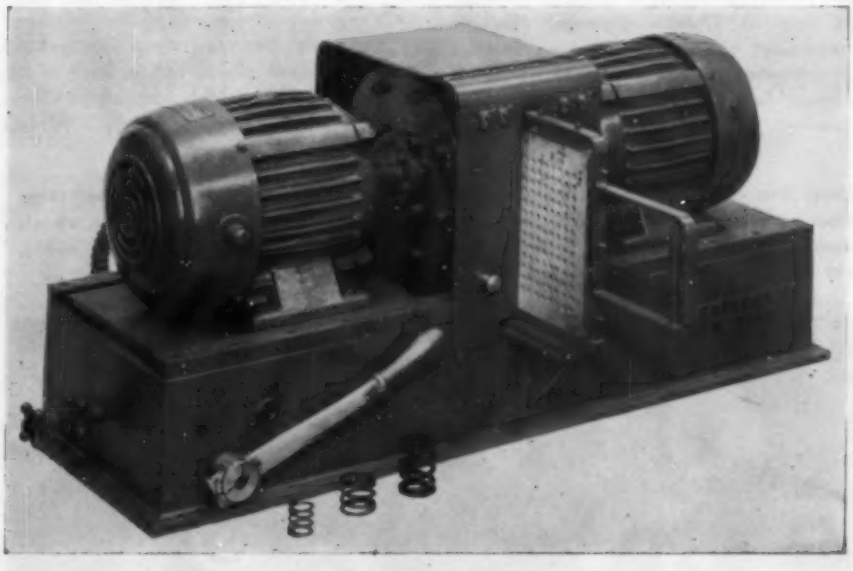

## Spring Grinder For Small Orders

The Carlson bench mounted double end disc grinder simultaneously grinds both ends of compression springs. Its recommended use is for small production orders up to 5000 springs. Other uses, as for grinding ball bearing frames, piston rings, etc., are possible.

The machine is designed for grinding the ends of compression springs with wire diameters ranging from .010" to .0625", but heavier wires up to ⅛" have been ground. Spring lengths vary from ⅛" to 4-½". The grinding wheels can be run in opposite directions and slowly brought together to dress each other. The Carlson Co., 277 Broadway, New York 7, N.Y.

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## High Speed Drum Sander Permits Abrasive Savings

Cone-Loc drum sander, manufactured of a new type high tensile strength aluminum alloy, is a split drum wheel that permits savings in coated abrasives, because it uses simple strips torn off the ordinary "economy roll." No special end clips are required.

The balanced abrasive drum will op-

erate safely at speeds up to 9800 s.f.p.m.; is available in a variety of diameters. American Diamond Saw Sales, 120 N.W. Ninth Ave., Portland 9, Ore.

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Sixty-seven solid years of *specialized experience* stand behind White & Bagley Grinding Lubricants and Coolants. Here are some of the W & B products that are *boosting production, reducing grinding costs,* and *producing better finishes* for more and more plants throughout the world:

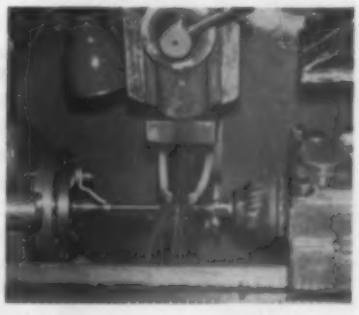
**W & B Lubricant 1888** — insures rapid and clean stock removal; keeps wheels open and free-cutting; permits the use of finer wheels to produce smooth finishes.

**W & B Grinding Concentrate 1500** — transparent and foamless; gives unusually keen grinding action and rapid chip settling; for grinding ferrous metals.

Courtesy, Norton Company

**W & B Grinding Lubricant E-1** — produces the highest reflective finish; permits rough grinding and finishing with the same wheel.

**W & B Grinding Oil 1572** — for close-tolerance, critical oil grinding; especially desirable on machines which perform a wide range of oil-grinding operations.



Courtesy, Jones & Lamson

**W & B Base L** — adds potency (sulphur and fat) to petroleum or cutting oils to give improved results in grinding and machining.

Let us help you with *your* needs for grinding lubricants and coolants. We specialize in *your* requirements. For further information, mail the coupon today!

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Worcester, Mass. Detroit, Mich.
*Originators of Grinding Lubricants*

W+B INDUSTRIAL LUBRICANTS

The White & Bagley Company
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☐ 1888 ☐ 1500 ☐ E-1 ☐ 1572 ☐ Base L

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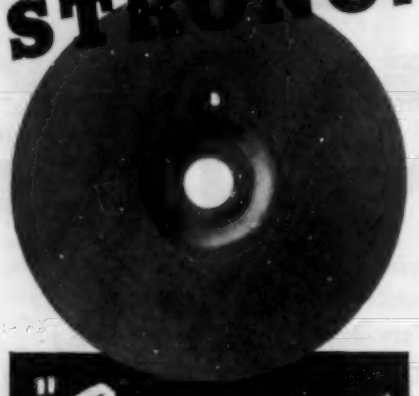
Encircle No. 226 on card opposite Page 68

# SAFE! STRONG!



"American"

## NR AMERFLEX depressed center WHEELS

Designed with nylon reinforcing
Safe — free-cutting — economical.

**SAFETY PROVED BY TESTS**

In competitive tests, an independent laboratory applied 500 pounds pressure to the hub of a 9 x ¼ x ⅞ Amerflex Wheel, supported only at its periphery, before the wheel cracked. To detach the broken pieces, it was necessary to put the wheel in a vise and twist it sideways. These tests proved the Amerflex Wheel far superior to competing wheels.

For our own destruction tests, a 9 x ¼ x ⅞ A16 NR Depressed Center wheel was mounted on a cut-off machine, and while running, the wheel was ruptured by striking it with a pipe. The machine was stopped without the pieces flying. Later the broken wheel was again run in an enclosed testing machine at 10,000 RPM and the reinforcing material still held the fragments securely.

Try this new Amerflex NR wheel in your shop. Ask for further information . . . mail the coupon today!

**American Emery Wheel Works**
**Red Bridge, Providence 1, R. I.**

Send additional information on your new NR Amerflex Depressed Center Wheels

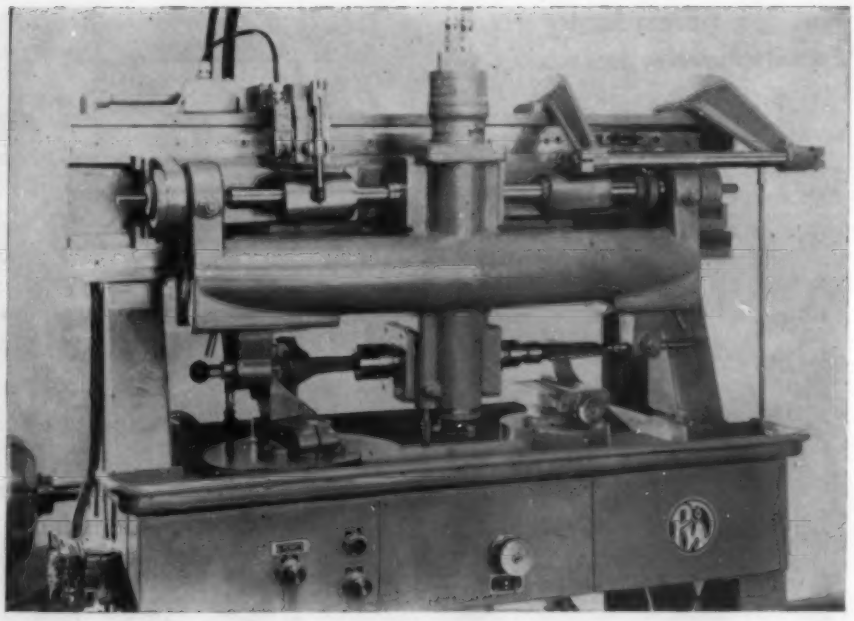
Your Name.....

Title.....

Company.....

Address.....

Encircle No. 227 on card opposite Page 68

## Anti-Friction Centers Increase Tool Life In Turbine Blade Grinding Operation

The Pratt & Whitney turbine blade airfoil grinder uses three cams to guide its grinding operation. The velocity cam and arbor at the upper left, the wave cam and arbor at the upper right, and the profile master cam at the lower right are left in the machine during the jet blade grinding cycle.

These arbors are of considerable weight, and it was found that using solid centers resulted in excessive wear of the arbor's center hole.

In order to increase the life of these units, a change was made to RED-E anti-friction spindle type centers, which have a ¾" diameter housing and a knurled handle for ease of adjustment. The center is constructed with 1 No. 7R3 single shield and 3 No. R3 no shield precision New Departure ball bearings, preloaded, locked-in and separated by precision spacers for maximum rigidity and minimum deflection. A ⅛" diameter, 60°, hardened steel alloy point revolves in the bearings. Ready Tool Co., 554 Iranistan Ave., Bridgeport 5, Conn.

Use HANDY Card, opposite page 68. Encircle No. 108

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QUALITY CONTROL Calls For PRECISION FINISHES on CARBIDE TOOLS, DIES, ETC.

"MICRO MESH"
PURE DIAMOND
LAPPING COMPOUND
WILL SOLVE YOUR
LAPPING
PROBLEMS
and give you
MIRROR
FINISHES
. . . in minutes instead of hours
write for details

A-1 ABRASIVE LABORATORIES
139 DUANE STREET NEW YORK 13, N. Y.

Encircle No. 228 on card opposite Page 68

We buy surplus diamond wheels and tools, also diamond wheel stubs and sludges. Highest prices paid.

NATIONAL DIOCHEMICAL COMPANY
3106 W. LAKE ST. CHICAGO 12, ILL.

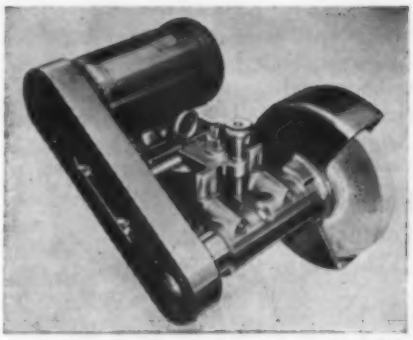
Encircle No. 229 on card opposite Page 68

**WANTED**

An Eastern manufacturer of grinding wheels is desirous of locating a qualified abrasive engineer to operate in the Southern part of Connecticut. Only applicants with experience will be considered, with preference given to man familiar with the territory. State age, place of residence, references, and salary expected.

BOX NO. 3, WHEATON, ILLINOIS

Encircle No. 230 on card opposite Page 68



## Heavy Duty Tool Post Grinder For Cylindrical, Surface Work

The series 25 three hp tool post grinder, for heavy duty cylindrical and surface grinding, is powered by a constant speed induction motor; swings wheels up to 12" in diameter by 1½" face, at speeds of 1750 rpm.

Grinder is claimed to convert any basic machine tool into a precision external grinder. It is designed for mounting on lathes 20" or larger, planers, shapers, vertical boring mills, etc. Motor has built-in magnetic starter and overload protector. Cast iron frame provides vibration-free mounting.

Quill 3" in diameter is machined from solid bar stock, and is equipped with oversize Timken tapered roller bearing, grease-lubricated and preloaded at the factory. At 1750 rpm bearings have a radial capacity of 955 lb. and a thrust capacity of 655 lb. Double V belt drive transmits power smoothly from motor to quill.

Center line of spindle to center line of mounting post is 3-37/64". Quill adjusts vertically 1⅜" for quick wheel centering by turning hand wheel. Operating weight is 176 lb. Available for 220v or 440v, 3 phase, 50/60 cycle, ac operation. Dumore Precision Tools, 1300 17th St., Racine, Wis.

Use HANDY Card, opposite page 68. Encircle No. 110

## Neoprene Rubber Wheel

Neoprene rubber permanently bonded to a cast aluminum wheel under tremendous heat and pressure, provides industry with the newest entry into the abrasive wheel field. Called the All-Four Abrasive Wheel, it is designed to perform equally well the four basic abrasive functions of grinding, sanding, polishing, and deburring. The wheel is effective on wood, metal, plastic, and rubber. Its live rubber base serves as a cushion under the abrasive cloth as well as preventing slippage. It is claimed chipping, grooving, and exploding problems are ended with the wheel and a special locking device ends abrasive cloth fly-off. C. R. Vogt and Co., 1528 - Third Ave., Moline M14, Ill.

Use HANDY Card, opposite page 68. Encircle No. 111


NEW 6" BELT GRINDER only $165.00!

THIS LOW-COST Engelberg/ Porter-Cable Abrasive Belt Grinder supplements other machines in your shop to step up production and improve results. Use it as a clean-up machine alongside the miller, shaper, automatics, hacksaw or shear. It will remove burrs, cutter or tool marks with speed and smoothness. Use it for polishing, taking off stock, breaking sharp corners. Use it in the gear-cutting department where it will whisk off a burr in an instant. Use it to touch up tools for the set-up men. Use it in the assembly department for fitting parts. Us it in the tool room for grinding flats, making and repairing jigs, sharpening tools.

Practically every department in your plant will find scores of uses for this latest addition to the Engelberg/Porter-Cable line of Abrasive Belt Grinders. Get complete information—mail coupon today.

Model 648 Belt Grinder can be changed to horizontal position in just 5 seconds.

Belts easily changed—no need to tilt idler pulley.

THE ENGELBERG HULLER CO., INC.

The ENGELBERG Huller Co., Inc.
327 Seneca St., Syracuse, N. Y.

Send complete information on new Model 648 6" Belt Grinder and name of nearest distributor.

Name_____

Firm_____

Address_____

City_____ Zone____ State_____

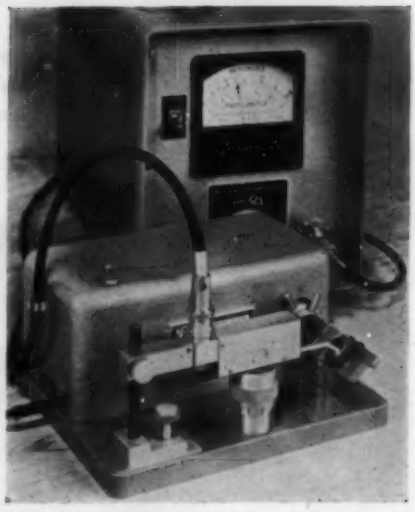
Encircle No. 231 on card opposite Page 68

## Pilotor Checks Roughness Around Surfaces of Rotation

The Type RE rotary pilotor, takes Profilometer roughness measurements around surfaces of rotation on small parts on a production basis. Surfaces of 1/32" to 2" radius or more may be measured, depending on the size of the part; tracers can be furnished to reach surfaces in parts of almost any shape.

Pilotor has a spindle that is belt-driven from a gear motor in the housing. The workpiece is held in an adapter, which in turn is held in the spindle. The adapter locates the center of rotation of the work surface on the axis of the spindle, and the work surface moves past the tracer point of a stationary tracer at a speed of 0.1" per second.

Change pulleys can be furnished to provide the same tracing speed for



surfaces of different radius. Reciprocating rotation through any desired arc from 10° to 350° is selected by two adjustment rings on the spindle, which are clamped by respective thumbscrews. By leaving both thumbscrews loose, continuous rotation is obtained. Micrometrical Mfg. Co., 345 S. Main St., Ann Arbor, Mich.

Use HANDY Card, opposite page 68. Encircle No. 112

## Platen Grinder Uses Contact Belt and Roll

The Curtis 91, platen grinders employs the principle of a serrated contact belt and serrated contact roll for grinding and polishing flat and radius surfaces.

A 175" long serrated contact belt is mounted behind a 226" long abrasive belt. The width of the belt can be varied in accordance with requirements. Pre-

sent models use 4" width up to 8".

The serrations on the contact belt flex the coated abrasive belt setting up a fast cutting action and greater chip clearance. The contact belt absorbs the friction against the steel platen and leaves the abrasive belt free to do its job, permitting the use of finer abrasive grit belts, which result in improved finish with no danger of burning the material.

The grinder is equipped with three station tables, one on each side and one on the end of the machine. Tables are adjustable for angle grinding. Three men can work on this machine at one time. Developed by the Curtis Machine Corp., 1301 E. Second St., Jamestown, N.Y., in collaboration with the Carborundum Co., Niagara Falls, N.Y.

Use HANDY Card, opposite page 68. Encircle No. 113

## Metal-bonded Diamond Wheels Are Fast Cutting, Do Not Glaze

Steelset metal-bonded, diamond-impregnated wheels are reported to be fast cutting and to have excellent non-glazing and non-burning characteristics coupled with long life, provided they are used with a copious coolant supply.

Wheels are produced by a hot-press powder metallurgical method. High vacuum coated diamond particles are claimed to insure an extra-strong gripping action by the sintered steel. This prevents their premature pulling out of the matrix. Fish Schurman Corp., 70 Portman Rd., New Rochelle, N. Y.

Use HANDY Card, opposite page 68. Encircle No. 114


**SANFORD** BENCH SURFACE GRINDER
MODEL SG

*for Wet*or Dry Grinding!*

**PRECISION • SPEED • SENSITIVITY**

**A low cost, precision machine for surface grinding dies, instrument parts, gauges and other small parts which would fit in the palm of the hand.**

**By using Sanford Bench Grinders many manufacturers of precision machinery have drastically cut over-all costs for finishing small intricate parts. This releases large, more expensive machines for heavier duty work.**

**The Sanford SG is the *only* low cost Bench Surface Grinder that**

- **Grinds to less than .0001" tolerances**
- **Operates without vibration**
- **Assures long life because Meehanite castings are used in its construction**

**SPECIFICATIONS**—4" traverse —8" longitudinal—6" vertical under 4" wheel. Approximate weight 160 lbs.

Complete details are included in illustrated bulletin. Send for your copy today.

Reconditioning facilities, replacement parts and special attachments are available. Send for price list.

**With optional equipment*

**SANFORD** MANUFACTURING CORP.
1026G Commerce Ave., Union, N. J.

Encircle No. 232 on card opposite Page 68

## Heavy Duty Belt and Disc Sander

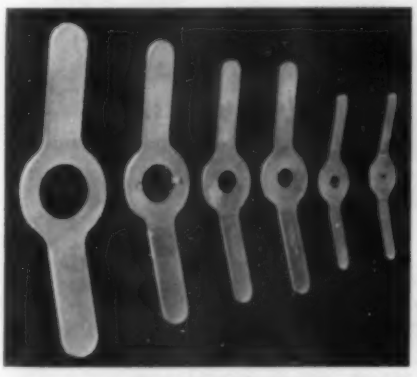
The Duro Model MD3066 combination belt and disc sander is made of heavy cast iron with reinforced ribbing. Machine includes a balanced heavy duty 10" disc and a versatile 6" belt sander on a 24" surface. The belt sander can be operated horizontally or vertically on a work bench or floor stand. Although both sanding surfaces operate simultaneously, on sealed ball bearings, they can be used individually on a variety of materials—wood, plastics, and metal.

A large auxiliary table which tilts 45° is interchangeable for use with belt or disc. Preloaded belt tensioning lever allows fast changing of belts without retensioning and retracking. A simplified knob control permits operator to adjust tension and tracking in a matter of seconds.

Hinged guard cover swings away to permit use of end of drum for sanding curved objects. The top portion of the sanding disc is protected with a cast shield sufficiently recessed to allow full use of the entire disc. Provision has also been made to accommodate a fence assembly which can be moved across the belt and tilted 45° in either direction or can be set diagonally for across belt sanding. In addition, a dust collector is available which operates from the same motor as the sander.

Standard equipment includes work table, mitre gage, machine pulley, one each aluminum oxide belt and disc. Duro Metal Products Co., 2651 N. Kildare Ave., Chicago 39, Ill.

Use HANDY Card, opposite page 68. Encircle No. 116

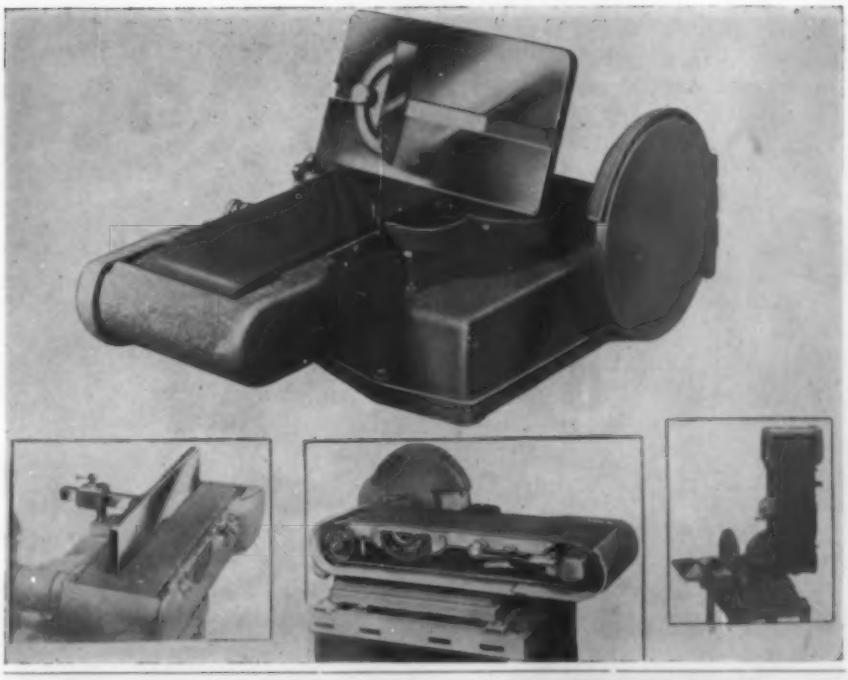


## Improved Balanced Grinder Dog

The Dayton Rogers Mfg. Co., 2824—13th Ave., So., Minneapolis 7C, Minn., has announced an improved balanced tail grinder dog made in eight sizes for ⅛" shaft up to and including 1" shaft.

The double tail is claimed to give correct balance, eliminating the override on the down cycle of the rotation of the grinder dog driving the work when held between centers on various grinding operations.

Use HANDY Card, opposite page 68. Encircle No. 117

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FULMER HONING MACHINES

SPEED PRODUCTION AND REDUCE COSTS TO MINIMUM

BECAUSE of rugged construction and engineering to handle greater loads than can be imposed upon them, FULMER HONING MACHINES assure LOW UPKEEP under the most exacting operating conditions.

All machines have a wide range of spindle and reciprocation rate. Practically all models are based on 3 steel columns to take the high torque necessary for heavy stock removal.

Speed cutting and finishing and insure tolerances as close as .0001 (±).

Photo taken in plant of THE HUNT-SPILLER MFG. CORP., BOSTON, MASS.

C. ALLEN FULMER CO.

*Write for your copy of our bulletin on honing.*

1246 First National Bank Bldg. Cincinnati 2, Ohio

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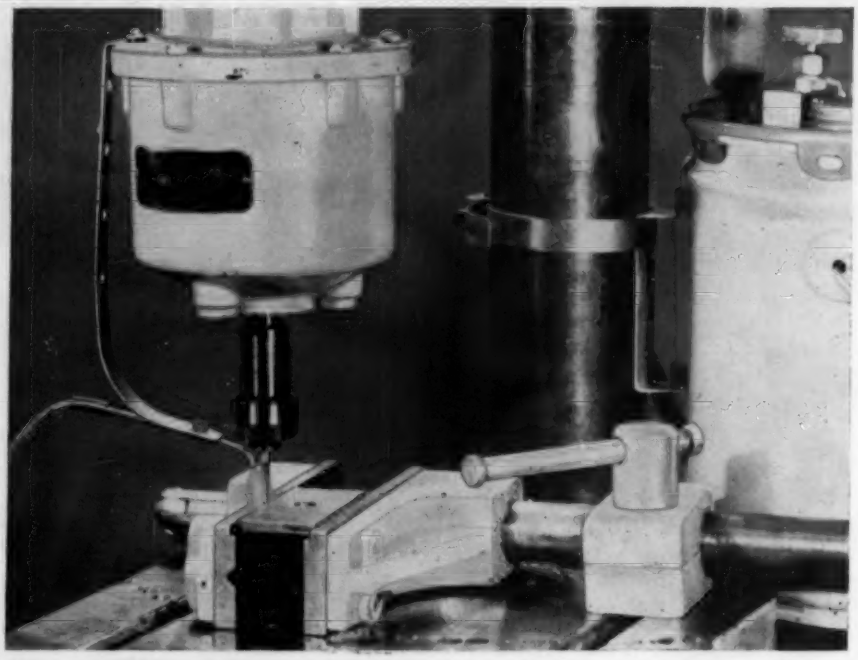

**Coolant Applied By Mist Spray Method**

Mistic Mist coolant system, which uses the mist spray method of application, is claimed to keep both wheel and work cool. Mist dissipates heat quickly because this type of cooling uses three basic principles of heat absorption: Heat is absorbed as compressed air expands; heat is absorbed as finely atomized coolant evaporates; heat is carried away by the movement of air.

Coolant mist can reach the exact point of greatest need—the cutting edge of the wheel. The coolant mist is applied from the clearance side of the tool and is therefore not deflected from the cutting edge of the chip.

The principle of Mistic Mist generation is this: Compressed air is passed through a small diameter tube, over the open end of another tube of appropriate size. This creates a vacuum in the liquid line which siphons the coolant from the container. The coolant is instantly vaporized and forms a conical mist pattern. At the same time, the compressed air expands, absorbing heat in the process, and displaces the heated air immediately surrounding the tool and work.

The volume of mist is controlled by a needle valve in the air line mounted on the container which also acts as a shut-off. Inasmuch as the mist is produced at the very tip of the nozzle, there is no interruption of coolant mist. Dribble of unatomized liquid at the nozzle has been entirely eliminated, the manufacturer claims.

All that is required to put system into operation is a simple hose connection from present air source and a supply of coolant. No regulator is needed.

Any good water soluble wax or soluble oil may be used. The proper mixture is dependent upon the nature of the work and the soluble base used. It is reported that burrs on the work are reduced because tools stay sharper. Coolant in the container will not turn

FOR
EMPLOYEES' SAFETY
USE
MORRISON
REVOLVING CUP GUARDS
on all portable grinders, using flaring or straight cup wheels.
Stringent Safety Codes and Laws DEMAND IT.
Consideration of Employees DEMAND IT.
Good Business DEMANDS IT.

MORRISON GUARDS have all been developed in collaboration with the Safety Committee of the Grinding Institute.

MORRISON REVOLVING CUP GUARDS offer maximum safety—highest visibility—lightest weight—greatest strength—and lowest cost.

In case of wheel breakage, hundreds of tests prove that Morrison Revolving Cup Guards hold pieces until machine can be stopped.

Guards for every portable grinding wheel. Write for literature.

MORRISON PRODUCTS Inc.
16916 WATERLOO ROAD CLEVELAND 10, OHIO

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Benefit Now
from the NEW, WIDER ADAPTABILITY & TIME SAVINGS of BRIGHTBOY RUBBER-CUSHIONED ABRASIVES

Brightboy's *abrasive and rubber, working together,* give you a wider concept of *time savings and finishing effects than you have ever associated with abrasives!* There are STOCK Brightboy rubber-and-abrasive grades and textures particularly "matched" for your jobs.

FIND OUT EVERYTHING YOU CAN DO WITH BRIGHTBOY NOW!

ASK YOUR DEALER FOR THIS NEW CATALOG which tells you: What Brightboy Is; What It Does; The Grains and Textures for your Jobs; The Machine Speeds Best Suited.

If your dealer cannot supply you, write us. Send us specifications on jobs when you have burring, finishing, cleaning and polishing problems or on which you would like to cut time costs.

BRIGHTBOY INDUSTRIAL DIV.
WELDON ROBERTS RUBBER CO.
95 North 13th Street, Newark 7, N.J.

America's Pioneer Manufacturer of Rubber-Bonded Abrasives

WELDON ROBERTS Brightboy RUBBER CUSHIONED ABRASIVES

Encircle No. 235 on card opposite Page 68

rancid in hot weather because it cannot become contaminated.

The manufacturer claims that tests have shown the following results with Mistic Mist: Surface grinding—reduces loading of wheels; prevents breakdown of form-dressed wheels; prevents checking of hardened steel; prevents warpage of work. Offhand grinding—reduces wheel loading; eliminates cooling in the water pot. Abrasive belts—prevents loading of belts; work is kept cool. Aetna Mfg. Co., Bensenville, Ill.

Use HANDY Card, opposite page 68. Encircle No. 118

## Union Improved Tool Grinder

For over forty years, the No. 3 Tangent-Arc Profile Grinders have ground Union's own cutters and reamers and helped to establish their fine reputation for quality. Through the years, Union has constantly improved these grinders to their present excellent design—completely modern and expertly built.

This versatile No. 3 Tangent-Arc Profile Grinder was designed to reduce

set-up time to an absolute minimum and will accurately and efficiently grind a wide variety of cutters, among which are included Convex Cutters, full half circle up to 2½" radius, 120° arc up to 4" radius. Concave cutters 0" to 5" radii.

Arbor cutters up to 10" dia. and 5" face. Shank cutters held by shank max. sizes 10" dia., No. 11 B&S Taper-Shank 5" length of cut. Shank cutters held by centers. 4¾" dia., 5" length of cut and 10" overall length of cutter.

Clearances may be ground on straight or spiral teeth at 0° to 90° from cutter axis, up to 5" length of cut.

Profiles composed of any combination of circular arcs and angles may also be ground. Manufactured by Union Twist Drill Co., Dept. FG, Athol, Mass.

Use HANDY Card, opposite page 68. Encircle No. 119

## SAF-400 Saf-Sight Shield

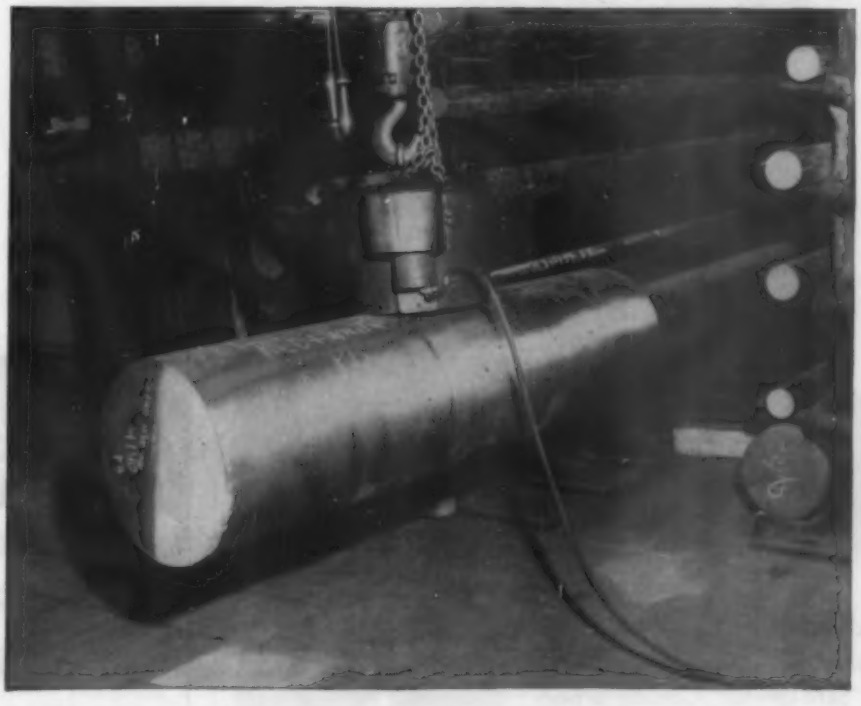
The Saf-Sight shield provides basic essential safety for the worker who "forgets" or "avoids" wearing goggles. The shield provides an auxiliary means of assuring basic protection for the careless worker. The Saf-Sight Shield is a simple, practical, low cost means of providing this essential protection.

A 5" x 7" laminated safety glass and cover glass are retained in a sheet metal frame. The cover glass on the

"under" or "work" side of the shield may be easily and quickly replaced when it becomes pitted or scarred. Information from: Junkin Safety Appliance Co., So. Floyd St., Louisville, Ky.

Use HANDY Card, opposite page 68. Encircle No. 120


*Walker Does It Again-*



**The strongest lifting magnet pound-for-pound ever made. Complete saturation . . . maximum efficiency . . . minimum wattage. Shown here—WALKER magnet lifting, with *12" line contact,* solid steel cylinder 13.5" diameter, weighing 2200 pounds, and utilizing about the same wattage as your kitchen lamp.**

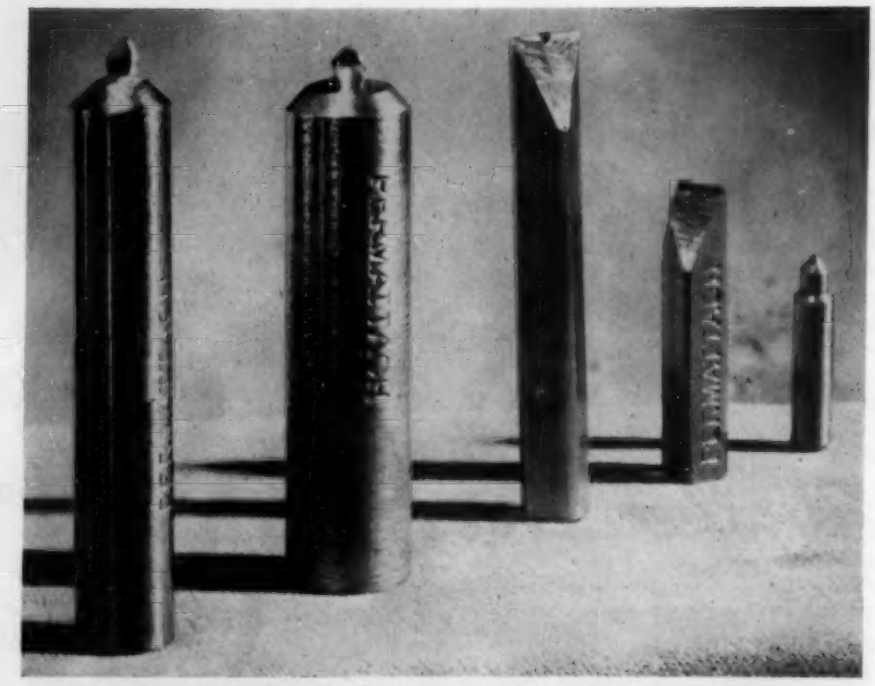
**WALKER magnets lift up to 50,000 pounds.**

**O. S. WALKER CO. Inc.**

WORCESTER 6, MASSACHUSETTS

*Original Designers and Builders of Magnetic Chucks*

Encircle No. 236 on card opposite Page 68



## Surface Mounted Diamonds Chemically Cling to Tools

The Permattach Diamond Tool Co., Inc., Milford, N. H., has announced a new line of industrial diamond tools manufactured under a process of diamond mounting originally developed by General Electric Co. and perfected by Permattach.

This process actually "wets" the surface of the diamond, causing a permanent chemical union between the stone and the tool shank. The technique breaks with the traditional need of embedding three quarters of the diamond in holding material. Maximum utilization of the stone is possible without resetting. According to the manufacturer, dislodgement of diamonds is eliminated, as normal pressure and friction will not weaken the security of the setting. Damage to the product resulting from stones that "pop off" or loosen in the setting is reportedly prevented, due to the chemical fusion between the stone and tool.

First run stones of any shape and size can be surface mounted on special tools for unusual cutting requirements. Tools are available in a complete line of wheel dressing, boring, thread grinding, radius and form dressers, shaped and lapped diamond tools. In addition, they are made to customer specifications in a wide variety of angles and radii and multiple mountings.

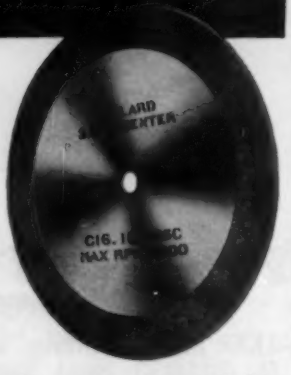
Use HANDY Card, opposite page 68. Encircle No. 121

## Lightweight Vertical Grinder

A new lightweight vertical grinder for cup wheels, cut-off wheels, sanding pads and wire brushes weighs only 6¾ lb., measures 5½" to top of spindle washer, or an over-all height of 7"; speeds of 8000, 6000 and 4500 rpm. Speed is controlled by quick acting governor threaded into rotor shaft. This feature eliminates rocker arm and simplifies maintenance, it is claimed.

The dead handle is removable for


NO MORE COPING WHEEL RETURNS!



Bullard does away with the old-fashioned wheel return nuisance — the Bullard "Safe-Center" Coping Wheel is simply discarded when worn out. The old style heavy steel center is eliminated — construction is stronger, yet 50% lighter weight. Bullard molds this wheel as a complete unit by a special process — the center is rigid — the wheel has twice the usual cutting material. No danger of breaking or chipping of face — saves up to 50% operating costs.

*Write today for circular*

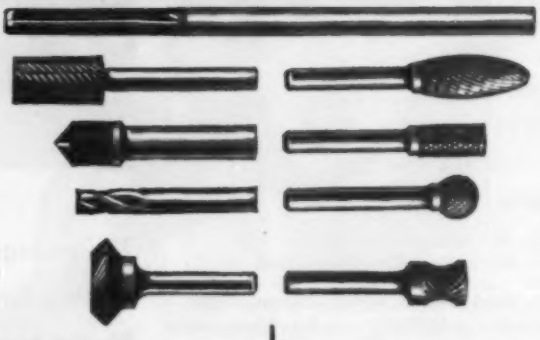
BULLARD Geo. H. Bullard COMPANY INCORPORATED

HOPKINTON ROAD WESTBORO, MASSACHUSETTS

SPECIALTY MANUFACTURERS OF RESINOID BONDED HIGH SPEED GRINDING, CUT-OFF AND COPING WHEELS

Encircle No. 237 on card opposite Page 68

ESSEX *Precision* CARBIDE & HIGH SPEED CUTTING TOOLS



CARBIDE TOOLS:
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HIGH SPEED STEEL TOOLS:
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*All H.S. Steel & Carbide Tools salvaged and resharpened*
(Write for catalogue)

ESSEX ROTARY FILE & TOOL CORP.

Makers of Fine Tools Since 1868

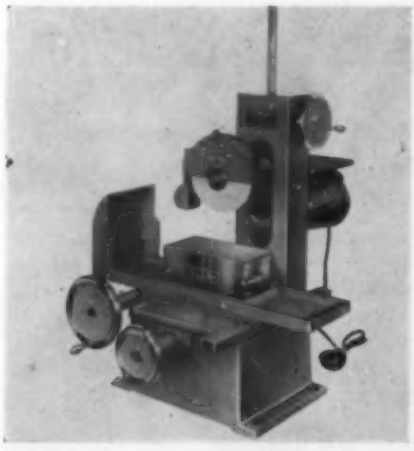
295 MADISON AVE. NEW YORK 17, N. Y.

Encircle No. 238 on card opposite Page 68

one handed operation and live handle can be installed in any of four positions for operator's requirement. Automatic oiler and air strainer are built in. The safety handle is optional equipment.

Plenty of power for 7" cut-off discs, 4", 5" or 6" cup wheels, 5", 7" or 9" sanding pads at proper speeds. Guards for cup wheels or cut-off wheels are standard equipment. Rotor Tool Co., 26300 Lakeland Blvd., Cleveland 23, O.

Use HANDY Card, opposite page 68. Encircle No. 122



## Bench-Type Surface Grinder Provides Heavy Cuts, Precision Finishing

The Harvey SG-48 claims rigidity and power for heavy cuts combined with high sensitivity for precision finishing, thus making it a dual-purpose surface grinder. Axial and radial rigidity of its dynamically balanced spindle is provided by mounting at each end in duplex angular-contact ball bearings.

This bench-type, hand-fed grinder is powered by 1/3 hp motor, resilient base rubber cradled, which drives the spindle at 3000 rpm. Capacity is 5½" x 9" x 7½" high under 6" wheel. Table travel is 10" longitudinally, 6" transversely, on ground and lapped ways.

All bearings, slides and working parts are enclosed for protection against dirt and grit. Machine is a product of Harvey Mfg. Corp., a subsidiary of Germanow-Simon Machine Co., Inc., 408 St. Paul St., Rochester 3, N. Y.

Use HANDY Card, opposite page 68. Encircle No. 123

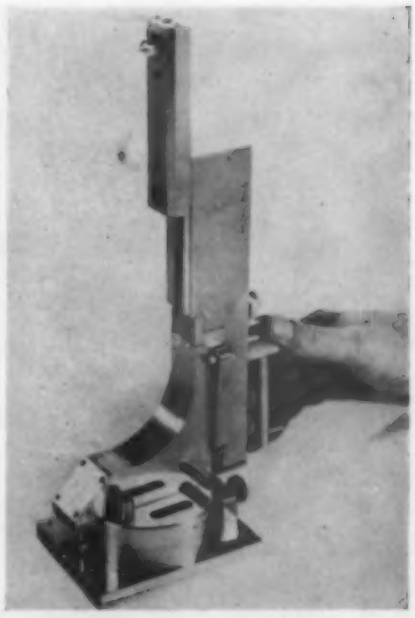
## Form Wheel Dresser Has Diamond Elevator Extension

Model H diamond elevator extension Fluidmotion Wheel dresser, recently announced by J & S Tool Co., 87-75 Dorsa Ave., Livingston, N. J., is adaptable to all types of grinders.

When used for form dressing surface grinder wheels this dresser is claimed to increase the range of diamond positions, allow a wider adjustment range, permit elevation adjustment of up to 6". For dressing of internal grinding wheels, wide adjustment permits adaptation to many types of grinders without extra attachment.

For cylindrical grinders, the large range of wheels the Model H will dress is from the smallest up to 24" diameter without extra provision.

Use HANDY Card, opposite page 68. Encircle No. 124



**Hanchett Magna-Lock Magnetic Chuck at Turchan Follower Machine Co.**

# REDUCES SETUP TIME 66.6%

**THE JOB:** Milling hard cast iron gibs, 1⅜" maximum width, variable lengths, 60° compound angle, .250" taper per foot. Roughing cut: 1⅜" max. width, 0.200" depth. Finishing cut: 1⅜" max. width, 0.050" depth. Spindle speed: 385 RPM. Cutter: 8-flute carbide tip 3" dia. Table speed: 15 IPM—20 IPM. Stock removal: Approximately 4 cu. in. per min. Fixture: mechanical.

**THE PROBLEM:**

1. Fixture setup time and handling was 60 minutes plus time required to layout, drill and tap holes in the gibs to coincide precisely with the bolts of the fixture. Spacing varied between 9" and 10" at several intermediate increments.
2. The holes were not functional parts of the gibs, being used only to hold the gibs while being milled.
3. Because of the several milling operations, the gib had to be removed each time and re-bolted to the fixture.

**THE SOLUTION:** A Hanchett MAGNA-LOCK Magnetic Rectangular CHUCK positioned on a sine bar, the milling machine cutter spindle being swiveled to the corresponding angles.

**THE RESULT:**

1. FIXTURE SETUP AND HANDLING TIME—20 MINUTES.
2. Layout, drilling and tapping operations eliminated.
3. Time required to re-bolt gibs on fixture for each operation eliminated.

You, too, can increase your machines' productivity with Hanchett Magna-Lock Magnetic Chucks and Devices. Take advantage of Magna-Lock's experience and engineering know-how—at your service to help solve your holding problems. Magna-Lock is the only *exclusive* manufacturer of magnetic chucks and devices.

WRITE TODAY, Dept. GF-75.

*Request Magna-Lock as original equipment on your new machines.*

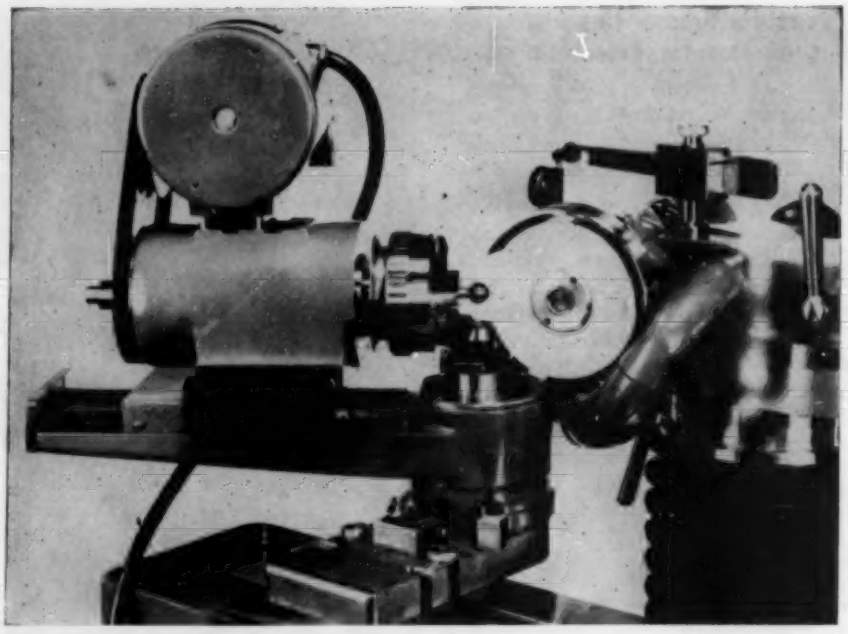
Magna-Lock

Hanchett MAGNA-LOCK CORPORATION

*Magnetic Chucks and Devices*

BIG RAPIDS, MICHIGAN, U.S.A.

Encircle No. 239 on card opposite Page 68



## Ball Grinding Attachment For Use on Surface, Tool Grinders

The Swedish-crafted Jungner ball grinding attachment, which is used for grinding spherical plug gages, balls on shaft ends, and most types of circular work, has been designed for use on surface or tool grinding machines and is claimed to hold accuracy to .0001".

Setting up for grinding is accomplished with the unit's built-in diamond setup gage and any standard gage blocks. The unit is supplied with a 3-jaw chuck with a repetitive accuracy of .0001" and a 220 v., 3 phase, 60 cycle, 340 rpm motor.

Spherical capacity is 2½" dia., while capacity of chuck is from 1/16" to 3". Maximum shaft capacity is 8" x ⅜". Taper hole in workhead spindle is No. 4 Morse. Nife Inc., Copiague, N. Y.

Use HANDY Card, opposite page 68. Encircle No. 129

## Abrasive Speed Tops Three Miles Per Minute

Through the development of a special method of processing abrasive coated cloth discs, New Era Engineering Co., 458 West 29th St., Chicago 16, Ill., has produced a grinder which operates at a perimeter speed of more than 18,000 feet per minute.

Known as the Neeco-2-Twenty abrasive coated cloth disc grinder, the unit is a twenty-inch diameter double disc machine. It is powered with a special 10 hp motor, adequate to handle heaviest material removal loads without reducing disc speed. It is direct driven, and supplied in 220 or 440 volts, 60 cycle.

When both rapid material removal and fine finish are required, the use of coarse grit abrasive on one disc and fine grit abrasive on the other disc will accomplish this efficiently and economically. In tool grinding, the increased abrasive speed of the grinder is claimed to produce sharper cutting edges and finer finishes. As optional equipment, its own dust collector may be housed within the machine itself.

Use HANDY Card, opposite page 68. Encircle No. 127

## Waterproof Abrasive Resists Filling

Wetordry Fabricut is a mesh-type waterproof coated abrasive product resistant to filling and loading. The material is composed of a cloth mesh coated on both sides with mineral grains bonded to the cloth with a heat-resistant, waterproof resin. It is available coated with aluminum oxide or silicon carbide mineral, and it can be used for either wet or dry sanding, by hand or machine.

Stock being removed passes through the openings in the mesh. If the mesh does become clogged, it can be blown clean with compressed air. The material is available in coarse to fine grits, ranging from 100 to 400. Roll sizes run up to 2½" in width; disc sizes include up to 18" diameter; and standard sheet sizes are 9" x 11", 3" x 8" and 3" and 3-2/3" x 9". Minnesota Mining & Mfg. Co., Dept. A5-163, 900 Fauquier St., St. Paul 6; Minn.

Use HANDY Card, opposite page 68. Encircle No. 130

## Magnetic Coolant Separators To 100 GPM Capacity

Delpark-Dings magnetic coolant separators separate metal particles from coolants by magnetic attraction; can be used for honing, lapping, grinding, shaving, broaching, milling, metal roll forming mills, glass polishing operations and oil reclaiming processes. Units may be used independently where partial separation is adequate, or for prefiltration separation to reduce load on the filter. Separators are made in capacities to 100 gpm.

Metals vary in their response to magnetic attraction. Copper, aluminum, nickel and other alloys, as well as grinding wheel particles, are not capable of responding to a magnetic field. Application of magnetic separators under such conditions would be ineffective. Industrial Filtration Co., Dept. D-290, Lebanon, Ind.

Use HANDY Card, opposite page 68. Encircle No. 128

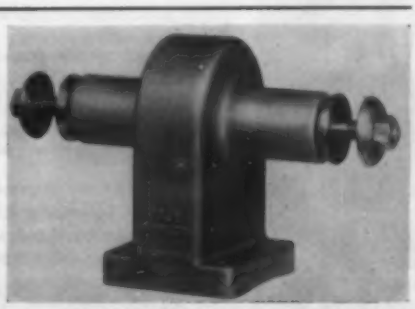
## Universal Cutter and Tool Grinder Has Motorized Tilting Head

The tilting head of the Covel No. 12A universal cutter and tool grinder has direct 1 hp motor driven spindle. Cup wheels can be used for grinding most clearance angles, producing a strong, long-lasting cutting edge on tools. Most cutters and reamers can be ground all over with a single setup.

Clearance angles can be read directly in degrees from the scale located on the head. Covel Manufacturing Co., Dept. P16, Benton Harbor, Mich.

Use HANDY Card, opposite page 68. Encircle No. 125

### Bench Grinder for Light Grinding



The Poly "Stubby" is a smaller copy of the heavier multi-purpose grinders manufactured by Poly Products Co., 230 E. Pomona Ave., Monrovia, Calif. The Model D4 is useful where slower or faster than normal motor speeds are required.

Shaft is precision-ground steel and balanced on ball bearings. Cast aluminum housing is open in back and base for either rear or undertable drive. Spindle size is ½" dia. x 11⅛" long. Wheel capacity is 6". Polishing, buffing, sanding, brushing and finishing wheels of all types may be used, as well as those for removing metal.

Use HANDY Card, opposite page 68. Encircle No. 126

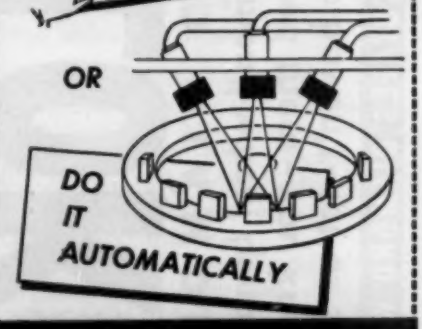
PRESSURELOK - 224
RESINOID DIAMOND WHEELS
— the best diamond wheel bond ever developed —
if you've used them - you know they're best!
if you haven't - let us show you!
UNITED STATES DIAMOND WHEEL CO. AURORA, ILL.
Encircle No. 240 on card opposite Page 68

which of these
POLISHING
PROBLEMS
are yours?

CHECK*

- ☐ Reduction of belt sanding stages
- ☐ Cutting down buffing time
- ☐ Reduction of hand polishing
- ☐ Blending directional grind lines
- ☐ Lowering micro-inch finishes
- ☐ Exposing cracks and fractures
- ☐ Smoothing belt marks
- ☐ Imparting non-directional finishes
- ☐ Semi-reflective surfacing
- ☐ Blending brush marks
- ☐ Surface uniformity
- ☐ Removal of stress marks
- ☐ Obliterating
  - ☐ Scores ☐ Tool marks
  - ☐ Reliefs ☐ Chatter
  - ☐ Pits ☐ Scratches
- ☐ Matte finishing
- ☐ Thread fit and turnability

OR

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TWO SPEED

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747-D WINDSOR STREET
HARTFORD 5, CONNECTICUT

Encircle No. 241 on card opposite Page 68


## Sander Combines Two Actions: Roughing and Finishing

The Detroit Model D. A. dual action air-powered sander operates with a dual action—moving in two directions at the same time. It turns 6000 rpm's to the right, and at the same time moves in a fast reverse action to the left. Faster cutting and savings in abrasives are reported.

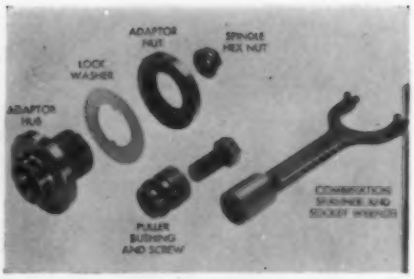
The "shift ring" instantly converts the unit to a high-speed off center spinner. The off center action reduces normal abrasive swirls to a minimum, enabling workmen to polish steel as well as nonferrous metals.

Weight of sander is approximately three pounds. The dual action counteracts torque, therefore is simple to use and easy on the operator, according to the manufacturer, the Detroit Surfacing Machine Co., 1333 E. Eight Mile Rd., Detroit 20, Mich.

Use HANDY Card, opposite page 68. Encircle No. 131

## Grinding Wheel Adaptor with Wheel Puller

A precision ground wheel adaptor for tool and form grinding wheels designed with a wheel-pulling accessory to reduce wheel breakage is announced by The Wm. Sopko & Son Co., 140 E. 267th St., Cleveland, Ohio. Said to be the first low-cost adaptor to incorporate the puller feature, the Precision Adaptor consists of the ground adaptor hub, adaptor lock washer, and adaptor nut.




The assembled unit with the wheel in place is locked to the spindle by means of a hex head spindle nut.

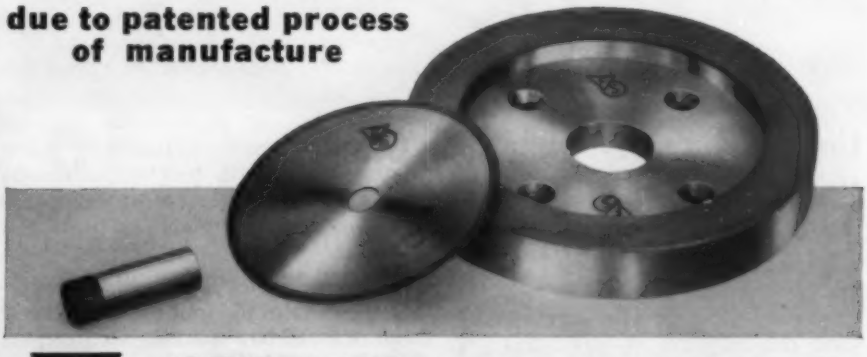
The precision wheel adaptor is available in three sizes for grinding wheels up to 1⅛" thick. It is also available in right- and left-hand threads, as desired. The unit, said to fit all 1" spindles with a 3" tpf, may be used on approximately 22 makes of grinders with special sizes available to fit the Cincinnati No. 2 Tool & Cutter Grinder.

The adaptor puller consists of a threaded steel bushing which screws into the open end of the adaptor. A 1½" puller bolt screws through the puller bushing pressing against the end of the spindle, gently forcing the adaptor assembly off the spindle. Use of the puller eliminates the need to strike the adaptor to free it from the spindle.

Use HANDY Card, opposite page 68. Encircle No. 132


FASTER CUTTING . . . LONGER LASTING

due to patented process of manufacture



FS TM REG STEELSET Diamond Wheels

(for wet grinding)

Attractively priced

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Fast delivery

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Made by a superior patented process, FS STEELSET Diamond Wheels have exceptionally fast cutting properties. Grinding costs are halved. They have excellent non-glazing and non-burning characteristics, coupled with remarkably long life—as much as five times greater than resinoid or vitrified bonds.

Produced by a hot-press powder metallurgical method. The diamond particles are coated by high vacuum technique to insure extra strong gripping action by the sintered steel bond. This prevents their premature pulling out of the metal matrix.

In many types for a wide variety of applications.

*Drills, blades, hones, lens laps, center laps, etc.*

FISH-SCHURMAN CORP., 81 Portman Rd., New Rochelle, N.Y.

Encircle No. 242 on card opposite Page 68

## DON'T MISS THE SHOW!

What may turn out to be the biggest industrial show ever held in this country will take place in Chicago, September 7-16. It is anticipated that three shows will attract 200,000 visitors. Plan to attend one or all of these events: National Machine Tool Show, International Amphitheatre; Production Engineering Show, Navy Pier; Coliseum Show, Coliseum.

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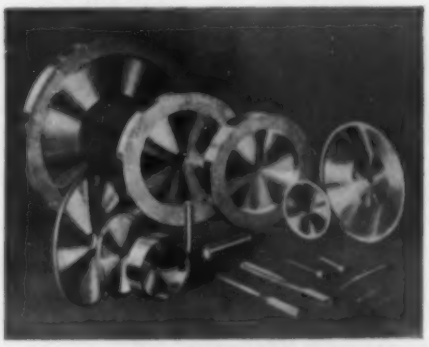
*a complete service . . .*

Don't be fooled by fancy new terms and descriptions of diamond wheels and tools. Basically they are still the same as always and we can furnish any type.



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# DUST COLLECTORS

**SAVES INSTALLATION TIME**

Stop dust quickly, at lower cost, with Dustkop. Thirty-seven standard models *ready to use* and available from stock. Dustkop conserves floor space, reduces maintenance. Collects almost all types of industrial dusts. Write for descriptive literature.

*Also a complete line of Mist Collectors*

**AGET MANUFACTURING COMPANY**
1408 East Church St. • Adrian, Michigan

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# NEW Apex DISC GRINDER $247*

*$247 covers model 15-S grinder complete with ½ HP, 3 PH. motor, F.O.B. Los Angeles.

## EXCLUSIVE FEATURES

1. **FORWARD & REVERSE SWITCH** — Switch is standard equipment for left and right hand jobs, adds life to grinding disc.
2. **WRAP-OVER GUARD** — Cannot flip off, keeps fragments out of eyes, rolls back to handle work at top of disc.
3. **DRY LUBRICATION** — All moving parts of grinder are lubed with dry lubricant, lasts life of machine.
4. **COUNTERBALANCED MECHANISM** — Table is easily moved up and down in a single motion, exposes full disc surface.
5. **SQUARING PIN** — Table can be accurately set at any degree, from 45° up or down, is automatically squared when returned to normal position.

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**Write for illustrated brochure and price sheet.**

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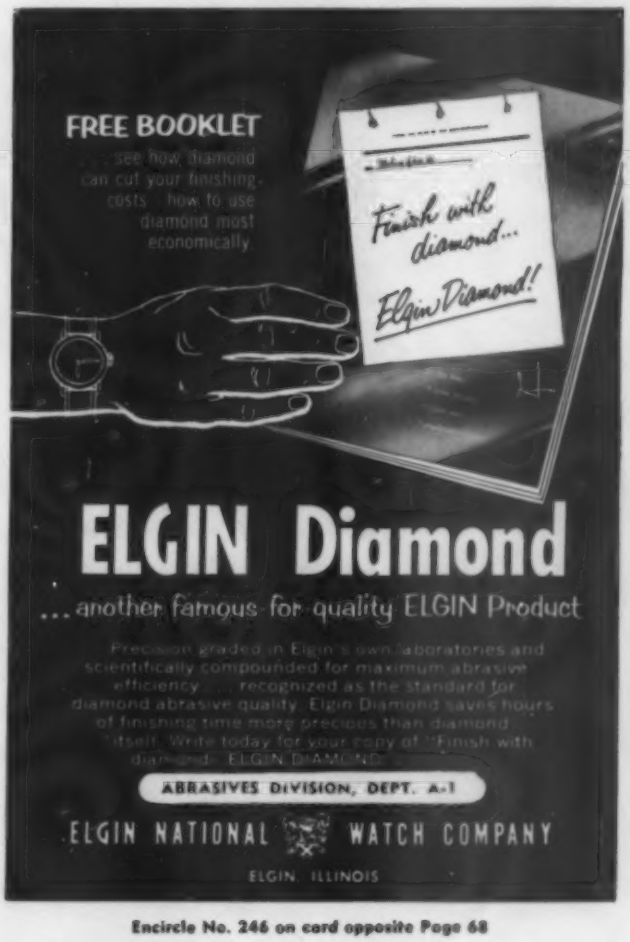
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. . . another famous-for-quality ELGIN Product

Precision graded in Elgin's own laboratories and scientifically compounded for maximum abrasive efficiency . . . recognized as the standard for diamond abrasive quality. Elgin Diamond saves hours of finishing time more precious than diamond itself. Write today for your copy of "Finish with diamond." ELGIN DIAMOND.

ABRASIVES DIVISION, DEPT. A-1

ELGIN NATIONAL WATCH COMPANY
ELGIN, ILLINOIS

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# Tough grinding jobs?

## Check Vulcanaire high speed precision grinding heads!

Grinding circular slot using Vulcan's Rotary Table and Magnetic chuck.

Many seemingly impossible grinding problems have been solved by adapting Vulcanaire to standard machines or by using one of Vulcan's specially designed machines.

On Surface Grinders, merely remove wheel and guard, clamp vertical or horizontal adaptor to machine as illustrated. No belts necessary. For instance, Vulcanaire used in connection with Vulcan's Rotary Table for Surface Grinders permits the grinding of a circular slot.

Vertical adaptor for Surface Grinders. Grinding small slots

Adaptors are in stock to fit the spindle of Vertical Milling Machines for grinding contours, holes and slots.

On Internal Grinding Machines Vulcanaire's infinitely controlled speeds furnish the correct surface cutting speed resulting in faster production and micro finish. The adaptor sleeve fits into present housing.

Applied to Jig Boring Machines, Vulcanaire is liked by leading precision manufacturers because its accuracy is guaranteed, producing Vulcanaire jig grinding of large and small parts.

Horizontal application. Grinding a shoulder Punch.

*Send us a blue print on your toughest grinding problem. Recommendations and sketches will be returned to you — no obligation.*

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Engineering, Processing, Designing and Building... Special Tools... Dies ... Special Machines ... Vulcamatic Transfer Machines ... Automation ... including the Vulcan Hydraulics that Form, Pierce, Assemble and size. ... Vulcanaire Jig Grinders ... Motorized Rotary Tables ... Plastic Tooling.

## VULCAN TOOL CO.

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# Index to Advertisers


A

**A-1 Abrasive** (Lapping Compound) ..... 72
**Aget Manufacturing Company** (Dust Collectors) ..... 83
**American Emery Wheel Works** (Grinding Wheels) ..... 72
**F. E. Anderson Oil Co., Inc.** (Lubricants) ..... 41
**Arter Grinding Machine Company** (Grinding Machines) ..... 60

B

**Barnes Drill Company** (Coolant Filters) .....4th Cover
**Behr-Manning** (Cutting Wheels) ..... 49
**Bryant Chucking Grinder Company** (Grinders, Internal) .... 47
**Bullard Company, Inc., George H.** (Coping Wheels) ..... 78

C

**Carborundum Company** (Cutting Wheels) .....16, 17
**Chicago Wheel & Mfg. Co.** (Grinding Wheels) ..... 25
**Cincinnati Milling Machine Co.** .....2, 3
(Grinding and Lapping Machines)
**Clipper Diamond Tool Co., Inc.** (Diamond Tools & Wheels) 71
**Cro-Plate Company, Inc.** (Polishers) ..... 82

D

**Diamond Products, Inc.** (Diamond Tools) ..... 58

E

**Electro Refractories & Abrasives Corp.** (Grinding Wheels) 38
**Elgin National Watch Company** (Industrial Diamonds) .... 83
**Engelburg Huller Company** (Abrasive Belt Grinders) ..... 73
**Essex Rotary File & Tool Corp.** (Cutting Tools) ..... 78

F

**Fish-Schurman Corp.** (Diamond Wheels) ..... 82
**Fulmer Company, C. Allen** (Honing Machines) ..... 75

G

**F. F. Gilmore & Company** (Industrial Diamonds) ..... 48

H

**Hanchett Magna-Lock Corp.** (Magnetic Chucks) ..... 79
**The Hill Acme Company** (Grinding & Polishing Machines) 8

I

**Industrial Filtration Company** (Industrial Filters) ..... 4

M

**Macklin Company** (Grinding Wheels) ..... 5
**Manhattan Rubber Division, Raybestos-Manhattan, Inc.** .... 6
(Diamond Wheels)
**Maserati Corp. of America** (Surface Grinders) ..... 64
**Morrison Products, Inc.** (Revolving Cup Guards) ..... 76

N

**National Diachemical Company** (Diamond Wheels) ..... 72
**National Grinding Wheel Co., Inc.** (Grinding Wheels) ..... 45
**Norton Company** (Cutting Wheels) .....50, 51

P

**Peninsular Grinding Wheel Company** (Grinding Wheels)
3rd Cover
**Pope Machinery Corporation** (Grinders, Tool & Cutter) ..... 63

R

**Ralph Watkins International Trade** (Diamond Wheels) ..... 83
**Rankin Brothers** (Disc Grinders) ..... 83
**Raybestos-Manhattan, Inc.** (Diamond Wheels) ..... 6
**Robbins, Omer E., Company** (Magnetic Chucks) ..... 61

S

**Sanford Mfg. Co.** (Surface Grinders) ..... 74
**Simonds Abrasive Company** (Grinding Wheels) ..... 7
**Sperman Metal Specialties** (Dressers) ..... 66
**Spitfire Tool Company** (Lapping Machines) ..... 66
**D. A. Stuart Oil Co., Ltd.** (Cutting Fluids & Lubricants) .... 27
**Sundstrand Magnetic Products Co.** (Coolant Separators).... 52
**Sunnen Products Company** (Honing Machines) ..... 31

T

**The Texas Company** (Lubricants) .....2nd Cover

U

**United States Diamond Wheel Co.** (Diamond Wheels) ..... 81

V

**Vulcan Tool Company** (Grinding Heads, Rotary Tables) 62, 84

W

**O. S. Walker Company** (Magnets) ..... 77
**Walls Sales Corporation** (Belt Sanders) ..... 58
**Weldon Roberts Rubber Co.** (Rubber-cushioned Abrasives) 76
**The White & Bagley Company** (Lubricants & Coolants) ..... 71

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These three grinding wheels look alike. But there is an important difference. X and Y do not have behind them Peninsular's sixty-six years intensive research and development. That's why Peninsular Grinding Wheels perform better, faster, and more economically on your swing frame and floor stand jobs.

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OF ABRASIVE AND METAL PRODUCTS CO.

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# when the HOLE business is a problem

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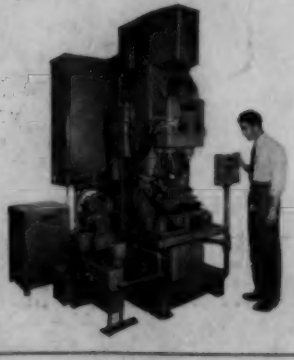

These transmission gears are a typical example of how Barnesdril Honing Engineering simplifies the hole finishing process and supplies accuracy and finish control. Completely automatic control provides bore-to-bore accuracy within .0005", stock removal of .0025", and 10 R.M.S. finish.

Electronic Hone Expansion on this No. 223 2-spindle Honing Machine maintains proper pressure between the stone and work for maximum rate of stock removal, with controlled geometric accuracy of roundness and taper. Because the stone is supported at the cutting edge with controlled feed pressure, longer abrasive life results, with less downtime on the machine for stone replacement.

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